GAS JOURNAL, JUNE 19, 1940

VOL. 230 92nd YEAR No. 4022

EDITORIAL NOTES

ECONOMY IN GAS PRODUCTION

IN last week's "JOURNAL" we reviewed broadly the June Institution Communications, all of which we published, in slightly abridged form, in that issue. We said that among the dominant notes struck in the contributions were the need for paying much more attention to the preparation and marketing of liquid and solid products resulting from the carbonization of coal at gas-works and to the economies which can be effected in process work. Our chief object, said Mr. Dixon in his Presidential Address, is to produce gas at a price that will enable us to sell it to prospective consumers at a competitive figure, and "we cannot afford any opportunity that presents itself of increasing our by-product revenue." To this we would add that the quality of the gas distributed must be such as to give satisfaction under modern and exacting conditions. In this regard we have in mind as one of the major and pressing problems the reduction of the organic sulphur content of gas to as low a figure as possible. It has been estimated—and this was pointed out in the Communication by Messrs. Henshaw and Cooper—that ½d. per therm would not be an unduly high price to pay for the benefits of a low sulphur gas, yet the difference in cost between recovering benzole up to 90% and the additional cost of 75% sulphur extraction is probably less than ½d. per 1,000 cu.ft.—one-quarter of the possible benefit. It has been amply demonstrated that the aim of 10 grains of sulphur and less per 100 cu.ft. can be accomplished without technical difficulty and at little expense even on a small works. We recall Mr. Norman Hudson's Paper to the Manchester District Association last Autumn, in which he set out the results of the operation of his benzole and sulphur extraction plant at Mirfield. The quality of the gas there has opened up a wider field of usage, it has reduced the maintenance costs of appliances, improved their appearance, and prolonged their life. What the benefits do in fact mean were brought out clearly enough during the hard frosts of last winter, when, due to the freezing of the water cooling system, the plant was temporarily out of action. A return to normal high sulphur content in the gas gave rise to protest and higher service costs.

The revenue from "residuals" is all-important with existing methods of gas manufacture, and there is no reason to suppose that improvements in their preparation for the market will not be effected. The manufacturers of gas making and treating plant are certainly not standing still. The advances made in gas washing plant—referred to by Messrs. Henshaw and Cooper—exemplify the results of efforts to improve the technique of gas manufacture; and the co-operative work of gas undertakings and makers of plant will yield further fruitful results and unfold further possibilities. Practices in ammonia recovery, for example, have not been awaiting a regeneration in price of the product, and processes developed may well receive a strong stimulus under conditions of restriction of acid supplies; and the utilization of low-pressure exhaust steam for process purposes has in recent years received much attention. The production of concentrated ammonia liquor or sulphate of ammonia by the indirect method may require an amount of steam varying from 18% to 28% of the weight of liquor distilled, according to the type of plant and whether or not the fixed ammonia is treated with lime. The Authors constructed a table of typical results from the use of exhaust steam, showing that for a reduction of 1d. per 1,000 lb. in the price of steam there is a saving of 7d. and 8d. per ton in the manufacturing cost of the concentrated liquor and sulphate of ammonia respectively. In the example, taking live steam at 1s. 6d. per 1,000 lb. and exhaust steam at 6d. per 1,000 lb., a saving is shown per ton of products of 7s. and 8s. Again, with vacuum distillation processes, a steam consumption nowadays as low as 22 lb. per gallon of benzole can be obtained when recovering 3 to 3½ gallons of benzole per ton of coal, compared with a figure of about 40 lb. per gallon under similar conditions when using live steam to the pumps and distilling at atmospheric pressure, effecting the major economy of using exhaust steam from the pumps as open steam to the still. In regard to carbonizing units, the stage has been reached where consideration of steam balance and utilization of exhaust steam is an important factor in design; and there are many installations of water gas plant where, for the run, exhaust steam is provided from a low-pressure accumulator collecting the exhaust steam from the turbine or engine driving the blower. Sometimes steam from pass-out turbines or from compound engines has been used for steaming vertical retorts, while the use of exhaust steam for preheating gas before its entry to purifiers is generally accepted.

The economical use of both steam and lime (for the removal of fixed ammonia) was dealt with in a Paper by Dr. F. H. Peakin to the Society of Chemical Industry. We are able to publish the first part of this highly useful contribution in our issue to-day. The main point which he brought out was that steam and lime consumptions are dependent on each other, and it is a matter for each individual works to balance up, from the cost of steam, the cost of lime, and the value of the ammonia produced, what level of hydrogen-ion concentration gives the best economic working. If steam is cheap, a low hydrogen-ion concentration value can be used. If lime is cheap and steam is dear, then it will pay that plant to work at a higher hydrogen-ion concentration value. All concerned with the working of ammonia distillation plants will, we feel sure, find Dr. Peakin's Paper of the greatest interest, especially at the present time when it is vital that ammonia from coal distillation should not be wasted.

REACTIVE GAS COKE

THE Communication to the Institution by Messrs. Thomas and Askey, on the production of reactive gas coke by alkali activation, is of special interest at the present time. The Authors have been busy on this problem for a long time now, and the present Paper follows naturally the contributions previously given ("JOURNAL" of Dec. 2, 1936) and brings up to date the results of their researches on the subject—which work, it is good to note, is to be continued. The Paper is, in fact, in many respects in the nature of an interim report. The main experiment described was made at the Garston Works

of the Liverpool Gas Company on four upwardly-heated Woodall-Duckham vertical retorts during a period of 17 months; and it was with the assistance of the Woodall-Duckham Companies that a device was designed to deliver the alkali mixture (1·25% calcium carbonate and 0·5% sodium carbonate) at a constant rate to the stream of coal passing to the crusher. The experiment was made with a Staffordshire coal, though shorter tests have been made with other coals which confirmed the effect of alkali activation.

As is well known, for many years the Liverpool Gas Company have been marketing a special coke, "Dryco," prepared by the use of selected coals and controlled carbonizing conditions, suitable for use in the ordinary open firegrate. This fuel has met with acceptance and the sale has now reached 17,000 tons per annum. It must be borne in mind, too, that considerable advertisement has not been used to develop its sale because, in the Authors' words, "it is obvious that the potential local demand is far greater than the ability of a gas undertaking to supply." This, to our mind, is a most significant statement. If gas undertakings made a coke suitable for the ordinary firegrate it would be assured of a wide sale at an attractive price. It was to the "Dryco" market that the alkali activated coke was delivered from the commencement of the operation of the process in October, 1938, until the retorts were shut down for inspection in March of this year. The fuel made has similar reactive properties to "Dryco" (gas for ignition in each case 4 cu.ft.; C.A.B. value, "Dryco" 0·036, activated coke 0·042). The ash content of "Dryco" is 6%, that of the activated coke 6% to 8% on the average, but the ash from the activated coke is denser than that from "Dryco," which, of course, is an advantage. As was to be expected from previous small-scale work, a considerable increase in steam decomposition occurs in the presence of alkali, and the same steam effect can be obtained with a much lower percentage of steam, which will have a favourable influence on the condensing and washing system.

Many interested in large-scale work on activation have not unnaturally expressed concern regarding the possible effects of alkali on the refractory materials used in the construction of the retorts. The Paper by Messrs. Thomas and Askey contains a section dealing with this aspect, which is obviously an important one. The Authors explained that after 17 months' working the jointing and brickwork of the retorts in which the trials were made are in excellent condition with the exception of two areas in each retort wall immediately above the sliding joint and in the first few courses of the silica work. The suggestion put forward is that, owing to the increased reactivity of the coke, the zone of steaming is concentrated in a smaller run of retort than is the case with unreactive cokes, and the consequent increased local ash release is causing greater erosion. A remedy would appear to be two-stage heating (put into practice after 12 months' operations) with a reduction of maximum local temperature and a greater length of coke travel for the steaming reaction. The results at this stage would, in fact, tend to confirm the opinion expressed by Mr. Askey in 1936 that the effect of employing alkali on the refractories of retorts would not prove as serious as some suggested. Further information will be forthcoming as a result of a cold inspection of the retorts. In any case, the Communication described successful laboratory experiments on the activation of coke by alkali after carbonization, the results of which have been "sufficiently promising to give some confidence in the possibility of preparing alkali activated coke in this way on the large scale." The cost is estimated to be approximately the same as for the pre-carbonization treatment.

There is, of course, the all-important question of the cost of gas production when employing this new technique, and the figures set out by the Authors comparing the cost of the gaseous therm from (a) untreated coal, (b) coal with the addition of alkali, and (c) the "Dryco" process can only give rise to encouragement. The lowest cost of gas production is obtained under alkali activation conditions—and the figures given include the necessary adjustments for increased breeze production under activated and "Dryco" conditions, and also the additional costs of cutting and screening which are not incurred in the sale of forked coke.

PRODUCER GAS TRACTION

FINALLY in this note we call particular attention to that section of the Paper dealing with the preparation of reactive coke for producer gas traction. Shortly before the war the method adopted was to add lime and sodium carbonate to a "Dryco" coal, and a coke was obtained with a C.A.B. of 0·024. In a cross-draught type of producer using a dry blast good gas was obtained four minutes after igniting the coke, a satisfactory test run was made over 90 miles, and no trouble due to clinkering was experienced. The work has been pursued since the war, the alkali being sprayed on the "Dryco" after carbonization. The resultant coke satisfies the specification of the Mining Association of Great Britain, and trials made by the British Coal Utilization Research Association and others, employing the B.C.U.R.A. up-draught producer using steam, have shown the coke gives results equal to those obtained by good quality low-temperature cokes. As we have mentioned before in these columns, the problem of grading has a most important bearing on the economics of the manufacture of mobile gas producer fuel. The normal method of free crushing as applied to the necessary gradings gives a high yield of undersized material—which would greatly increase the cost of the producer fuel. This is referred to by the Authors, but they also commented on a recently published method of crushing which has been shown to give high yields of closely-graded material. "If," they observed in their Communication, "this type of crushing can be developed it should provide the solution to the economic production of close-graded producer fuels." And, of course, sight must not be lost of possible developments in design of producer able to use a fuel of wider grading. The Authors' investigations, as we have said, are proceeding, and their present account is in the nature of an interim report. We look forward to the results of further work on this exceedingly interesting subject.

New Effort Urged

Lord Dudley Gordon, President of the Federation of British Industries, this week sent a message of encouragement to all engaged in industry. He said: "Industry has to supply, first of all, the instruments of war and other supplies so urgently needed for our fighting forces, and, at the same time, to continue in confidence and strength the means of keeping in being the life of the nation which depends on those forces, who, in their turn, depend on us. In this spirit industry must still further increase the great effort now being made so that we may resist all assaults that assail us, and, by our tenacity of purpose, retain the freedom which has been handed down to us."

Factory Safety

"A lost-time accident in a factory should be regarded as much a gain to the enemy as a casualty in the armed Forces." This statement was made by Lord McGowan, Chairman of Imperial Chemical Industries, Ltd., in his Presidential Address to the National Safety First Association. The Government's recognition of importance of accident prevention is shown by the inclusion of safety as one of the subjects to be covered by the Factory and Welfare Advisory Board of the Ministry of Labour and National Service. The truth of Lord McGowan's statement lies in the paramount importance of increased production to meet the needs of war. Industrial accidents constitute a serious brake on production. Speeding up of processes, and a huge influx of new and untrained employees into industry have enormously increased the risk of accidents. There has been a heavy crop of minor casualties, accompanied by an unduly high proportion of septic cases due to failure, especially of new workers, to realize the importance of immediate and proper first aid treatment.

The Industrial Welfare Society and the National Safety First Association produce a joint accident prevention service for industry, and the latest addition is a booklet specially designed to draw the attention of new employees to the fundamentals of works safety. In addition there are posters, pamphlets, and various other employee leaflets, many of which are specially applicable at the present time, and it is obviously desirable that such aids as these should be used.

Half-measures, said Lord McGowan, will not do. His experience is that an energetic safety department in each factory, responsible only to the senior works management, can not only secure very considerable reductions in the accident rate but can make a substantial contribution towards improving the general spirit of the works.

Personal

Mr. W. A. BARNETT, M.I.Mech.E., A.M.I.Chem.E., has been appointed Engineer and Manager of the Mid-Kent Gaslight and Coke Company, Snodland, Kent, in succession to Mr. Greenacre who is leaving to take up his appointment as Engineer and Manager to the Great Yarmouth Gas Company.

* * *

Councillor H. RILEY, who for many years has been Vice-Chairman of the Stalybridge Gas Committee, was confirmed an Alderman by the Stalybridge Council on June 10, and at the same time was appointed Chairman of the Gas Committee in place of the late Alderman J. W. Greenwood.

Obituary

The death took place in Glasgow on June 8 of Mr. ARCHIBALD STEWART, late Gas Engineer of the Blairgowrie Gas Undertaking, Perthshire.

Letters to the Editor

District Advisory Boards

SIR,—Mr. George Dixon, in his excellent Presidential Address, refers, under the heading "The Small Gas Undertakings" to the difficulties being experienced by those very small undertakings not under the control of larger ones, and points out that their resources are not such as can afford the technical or commercial standards of control that are desirable, and that they are therefore unable to avail themselves of prospective markets for gas; nor can the Gas Industry demonstrate the advantages of gaseous fuel.

His suggestion that there would appear to be a case for some district advisory Boards to offer such assistance as may be required for the benefit of the local consumers in particular, and our Industry in general, is much to the point and worthy of consideration.

Notwithstanding the advent of the holding company, the prime conception of which, it must not be forgotten, was the grouping of smaller concerns to enable them to be given that financial and technical help in development which, as isolated units, they are denied, many such small undertakings are still keeping the flag of the Gas Industry flying in isolated districts, in face of keen electrical competition. Their difficulties are to-day naturally increasing. Mr. Dixon suggests that a scheme for mutual assistance to these undertakings would be acceptable and advantageous—a statement with which all interested in such undertakings must agree.

It is hoped the matter will be further developed.

Yours, &c.,
C. HOLMES HUNT.

15, Victoria Street,
Westminster, S.W.1.
June 10, 1940.

Gasholder Heating in Quebec

SIR,—In regard to the article on gasholder heating in Quebec, published in your issue of May 29, I ask whether the latent heat of water has received due consideration in fixing 48° F. as the safe temperature at which to maintain the tank water to prevent anchor-ice-formation. 48° F. = 16° F. above freezing-point. Added to this is the latent heat of water, so there is the surprisingly wide margin of the equivalent of 96° F. to extract before ice-formation can take place.

As economy of cost of steam depends so much on reducing the radiation losses, it would seem (bearing in mind the latent heat of water) quite reasonable to reduce this 48° F. to, say, 35° F. or just sufficiently above freezing point to render the thermometers visibly operative.

Furthermore, circulation of the tank water being of so great an importance, I would enquire whether it be worth while to consider the introduction of all the eight supplies of steam, at points equally spaced round the lower depth of the tank, and thus better utilize the kinetic energy of the steam to induce horizontal movement, and the thermal energy of the steam to induce vertical movement in the tank water.

Yours, &c.,
H. J. TOOGOOD.

43, Uxbridge Road,
Hampton.
June 10, 1940.

The Following Recently Issued British Standard Specification can be obtained on application to the Secretary of the Institution of Gas Engineers, 1, Grosvenor Place, London, S.W.1, price 5s.: No. 84—1940: Screw Threads of Whitworth Form. (Superseding No. 84—1918 and 92—1919.) The following Revision Slip has also been issued by the British Standards Institution in connexion with BS/ARP/37: CF (ARP) 5597. Revision Slip to BS/ARP 37. Street Lighting under Wartime Conditions. Copies of this Slip can be obtained on application to the Secretary of The Institution of Gas Engineers.

The Municipal Year Book

The 1940 Edition of this work*—the 44th annual issue—has been completely revised and brought up to date. It comprises 51 sections, of which 42 are devoted to all the important branches of the civic administration, and the remaining nine sections to the descriptive records of National and Local Authorities and names and addresses of Members of Councils in Great Britain, Northern Ireland and Eire, and also lists of Joint Authorities.

Among the outstanding sections are those relating to Local Government legislation and Law Cases, Roads, Transport, Finance, Rating and Valuation, Housing and Slum Clearance, Town and Country Planning, Public Health, Education, Parks, Public Assistance, Water Supply, Public Cleansing and Sewage Disposal, Civil Aviation, Police Services, &c.

The Air Raid Precautions and Fire Services are dealt with extensively. Local Government Administration has, of course, been materially affected by the war, and both in the general survey of the year's administration and in the various appropriate sections the salient changes as a result of war-time conditions have been detailed. Emergency Statutes, Rules, Orders, Regulations, and Ministerial instructions are given in concise form for speedy reference.

An improvement this year is the thumb-indexing in place of tabs, marking all important sections and materially facilitating reference.

Mr. Walter Elliot, M.P., Minister of Health, in a general preface to the volume, refers to the "tremendous events" of the past year, and doubts whether these have made themselves felt in any department of administration more forcibly than in Local Government. "For the Local Authorities," he says, "these testing times have provided the opportunity of demonstrating once again, to a world in violent change, the essentials of that local democracy and local initiative which have so often proved both the great characteristic and the great strength of our civilization."

Captain Euan Wallace, M.P., Minister of Transport, contributes a Foreword to the Roads and Transport Sections.

*The Municipal Year Book and Encyclopædia of Local Government Administration: Published by The Municipal Journal, Ltd., 3-4, Clement's Inn, London, W.C.2, 35s. net.

New Chemical Publications

"A New Dictionary of Chemistry," edited by Dr. Stephen Miall with the assistance of many well-known chemists has been published by Longmans, Green & Co., price 42s. net. This dictionary fs comprised in a handy volume of 575 pages, into which has been compressed a remarkable amount of information. The treatise is not only a dictionary of chemical processes and materials but also includes a roll of notable chemists of the present and past generations. It will be useful not only to chemists but to a much wider field of people who need accurate information on chemical matters.

Another new publication is the Sixth Edition of Kingzett's Chemical Encyclopædia, revised and edited by Dr. R. K. Strong (Baillière, Tindall, & Cox, price 45s. net). The original plan of the earlier editions has been maintained while new subject-matter has been introduced whenever this was needed to bring the work up to date. The recent rapid advances in all branches of chemical science have made it necessary to expand the present edition beyond the size of its predecessors. The volume runs to 1,088 pages.

Extension of the Specification for Wartime Street Lighting

With a view to allowing greater flexibility in the siting of street lighting fittings, the Specification BS/ARP/37 has been revised in respect of Clause 4, Mounting Height and Spacing. No change has been made as regards the fittings to be used for spacings of not less than 100 ft., but additional information is now given as to how to instal fittings in situations where the pole spacings are between 50 ft. and 100 ft.

This revision has been effected by means of a sheet CF (ARP) 5597, copies of which may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, on receipt of a stamped addressed envelope.

Forthcoming Engagements

June.

28.—Waverley Association.—General Meeting, North British Station Hotel, Edinburgh.

July

5.—Manchester District Association.—Visit to Stockport.
13.—Western Juniors.—Summer Meeting at Minehead.

August.

13.—Irish Association.—Annual General Meeting at Dublin.
24.—Scottish Western Juniors.—Paper by J. Fulton on "Ammonia Recovery."

NEWS OF THE WEEK

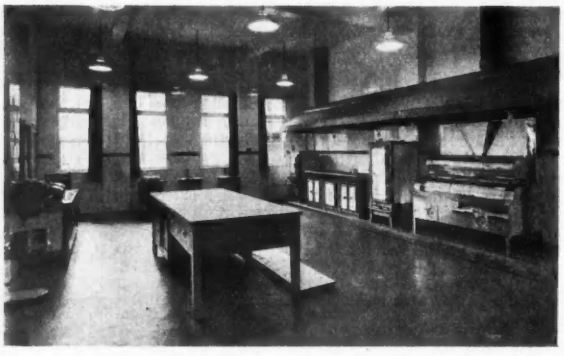
Gas Cookery Demonstrations were given in the Dundee Gas Showrooms from June 10 to 14, by Miss M. K. Gompertz, M.C.A., of Messrs. R. & A. Main, Ltd.

Four "Ideal" Gas Boilers, with calorifiers, pumps, and other equipment, for the heating installation at the Municipal and Highfield Hospital are to be fitted by the Sunderland Gas Company.

The First Gas-Driven Bus owned by the South Shields Corporation will be put into operation this month. The bus is a single-decker, and gas bags are being fitted to four other similar vehicles.

Subject to the Approval of the Establishment Committee, the Manchester Gas Committee have decided that application for the position of Chief Engineer be invited by public advertisement at a salary of £1,500 per annum.

At a Luncheon at the Housing Centre on Tuesday, June 11, Miss S. M. Hayes, of the Ministry of Food, spoke on "Food Restrictions and the Working-Class Budget." Miss A. M. S. Wilson, B.Sc., of the Women's Gas Council, was in the Chair.



The Middlesbrough Corporation Gas Department have just completed the equipment of this up-to-date kitchen at the West Lane Hospital. It will cater for staff and patients numbering 800 and includes examples of all the latest types of gas catering apparatus

Subject to the Necessary Borrowing Powers being granted by the Treasury, the Dumfries Town Council have resolved to install plant for the recovery of benzole and associated by-products. It was stated that approximately £3,000 would require to be borrowed.

An Ingenious Link-up with recent preparations to deal effectively with parachute invasion has been arranged in a showroom window display at Heywood, Lancashire. In conjunction with amusing depictions of "parashots" in action is the slogan: "Be Prepared for Visitors—Fix a 'Cannon' in Your Kitchen." The display has aroused a great deal of interest and favourable comment locally.

Radiation Limited have recently received the order for the complete equipment of the kitchen in a new aeroplane engine factory now under construction. Roasting ovens, boiling tables, fish-fryers, grillers, and pastry ovens are operated by gas, but the bulk of the other appliances such as steamers, boilers, hotclosets, &c., are heated by high-pressure hot water. All the usual accessories and labour-saving appliances are included in the scheme, which is to cater for 2,000 people.

At a Joint Meeting of the Motherwell Corporation Gas and Finance Committee a letter was submitted from the Scottish Home Department, approving the borrowing of a sum of £35,500 (except for £300 for purchase of a lorry), also a letter from the Treasury giving similar approval. The Committee unanimously instructed that the following offers be forthwith accepted: (1) Carbonizing plant (vertical retorts)—West's Gas Improvement Co., Ltd.; (2) exhauster—the Bryan Donkin Co., Ltd.; (3) scrubbing plant—Henry Balfour & Co., Ltd.; (4) benzole plant—Newton Chambers & Co., Ltd. It was further resolved that the Gas Manager be given authority to have carried out by the direct labour of the Department all necessary excavations and other works in connexion with the preparation of ground.

Details Have Been Sent Us by Mr. W. R. Oliver, Display Officer of the B.C.G.A., of an interesting new display scheme which the Studio has organized, with the approval and co-operation of the Ministry of Information. A three unit display is provided, comprising a centre panel 6 by 5 ft. for the showing of official news photographs and posters which will be issued by the Ministry, while two side units will carry statements bearing on the Gas Industry's importance in wartime. The display, which is of a permanent nature, is designed for the quick insertions of new photographs, four of which will be issued by the Ministry every 14 days through the Studio organization. Thus war news photographs will always be shown up to date, in a setting emphasizing the Gas Industry's war effort, linked with the name of the local undertaking.

Farnham Gas and Electricity Bill

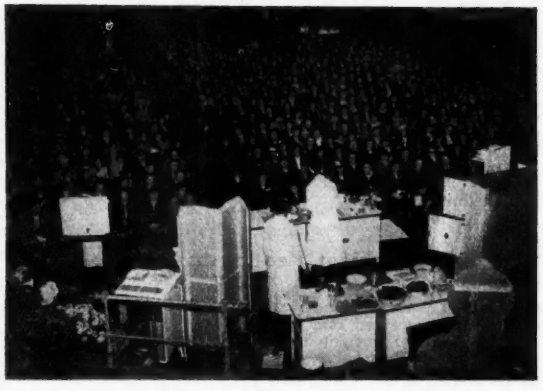
The Unopposed Bills' Committee of the House of Commons (Colonel Clifton Brown, Chairman of Ways and Means, in the Chair) considered on Wednesday, June 12, the Bill promoted by the Farnham Gas and Electricity Company. Its provisions include increase of capital and borrowing powers and the application of the basic price system to the regulation of dividends (as indicated in the "JOURNAL" of Jan. 3, 1940, p. 27).

It was explained by Mr. A. B. Winser (of Messrs. Sherwood & Co., Parliamentary Agents) that numerous points with regard to the provisions of the Bill had been raised by the Board of Trade and the Ministry of Transport and had been met, mostly by the withdrawal of clauses. But in addition, both the Board and the Ministry had suggested that Parliament should ask the promoters to justify the increased capital and borrowing powers they sought. The Bill asked Parliament to authorize additional capital and borrowing powers amounting to a total of £388,000; the Company estimated that the necessary capital expenditure during the next 12 years would amount to £210,000 for the gas undertaking and £180,000 for the electricity undertaking—a total of £390,000.

Evidence in support of the capital powers sought by the Company was given by Mr. A. W. White (of Messrs. Cash, Stone & Co., Chartered Accountants), who confirmed the estimates given of the Company's future requirements and pointed out that the Company was supplying gas and electricity in a developing area; he emphasized this by pointing out that the Company had spent £391,000 of capital during the past 10 years, an average of £39,000 per annum.

Questioned by the Chairman and other members of the Committee, who suggested that development in the area during the past 10 years had been due particularly to the increase of military establishments, he agreed that that was so in part, but added that there had been a large development of housing, following the electrification of the railway which served the area. That sort of development would be stopped during the war, of course; but he urged that expenditure of capital was necessary on gas-works and plant to maintain supplies, and on new mains and services, meters, and stoves; in the electricity undertaking the expenditure was necessary in connexion with distribution. The Company had overspent on capital and was overdrawn at the bank. Even so, the Company could not use its capital powers without consent from the Treasury.

The preamble of the Bill was proved, and the Committee ordered, that it be reported for third reading.



More than 1,200 people attended two sessions of wartime cookery demonstrations held at Leeds on May 28 under the auspices of the Leeds Gas Department and Radiation, Ltd. The afternoon session was opened by the Lady Mayoress of Leeds. Above is a photograph taken at one of the sessions

New British Standard for Screw Threads of Whitworth Form

The work on the revision of the British Standards Nos. 84 and 92 for B.S.W. and B.S.F. Screw Threads, which has been in hand for some time has now been completed by the issue of a new British Standard—"Screw Threads of Whitworth Form."

This new Standard is considerably more comprehensive than the previous specifications. Not only does it include tables of limits and tolerances for the B.S.W. and B.S.F. series, but also includes the limits and tolerances for the B.S. Pipe (parallel) thread when used for general engineering purposes, and also for threads having any reasonable combination of diameter, pitch, and length of engagement. Throughout the specification, tables are given for three grades of fit. The Appendices to the Specification relate to nomenclature and definitions, and give notes in regard to workshop and inspection gauges.

Copies of this Specification No. 84-1940 can be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 5s. 4d. post free.

BENZOLE . . .

THE country needs more benzole for chemical purposes and for motor spirit. Apart from the additional quantity which can be obtained from carbonising plants not now stripping, there are many directions in which all might look to ensure maximum production.

Among these may be mentioned the following :—

1. The employment of *total* stripping on those plants now practising only partial recovery.
2. The maintenance of wash oil in good absorptive condition as regards distillation range, viscosity and freedom from deposits.
3. The circulation of adequate quantities of wash oil at all times and especially with a view to compensating for varying atmospheric conditions.
4. The close control of the temperatures of the contacting gas and wash oil.
5. The effective stripping of the absorbing oil to maintain a uniformly high level of recovery from the gas.
6. The provision of adequate supplies of cold water for condensing and cooling purposes.
7. The full use of all modern developments leading to the enhancement of the yield of motor fuel, e.g., the efficient removal of organic sulphur and by this means the avoidance of heavy chemical washing, conserving unsaturated hydrocarbons in which gum formation can be inhibited.
8. The acceptance by the distributors of all benzole homologues which, in the relative absence of toluene, can be usefully incorporated in motor fuel.
9. The use of efficient and flexible fractionating equipment with completely controllable reflux system to provide the maximum yields of pure products at each distillation, thus eliminating the unnecessary recycling of intermediates with attendant distillation losses.

W-D BECKER OVEN PLANTS in this Country are producing annually upwards of 24,000,000 GALLONS OF CRUDE BENZOLE expressed as 65% at 120°C.

W-D

THE WOODALL-DUCKHAM VERTICAL RETORT AND OVEN CONSTRUCTION CO. (1920) LTD

Temporary Address:

UPLANDS · EPSOM ROAD · GUILDFORD

Members of the Society of British Gas Industries

Telephone : Guildford 3301 (5 lines). Telegrams : Retortical, Guildford

WARTIME COOKERY DEMONSTRATIONS AT DERBY

THE importance of avoiding any kind of waste, particularly food waste, was emphasized by the Acting Mayoress of Derby (Mrs. W. Neal) when she opened the first of four wartime cookery demonstrations arranged by the *Derby Evening Telegraph* in conjunction with the Derby Gas Light and Coke Company. Mr. T. Smith (Distribution Superintendent of the Gas Company) presided at the opening and extended a cordial welcome to Mrs. Neal. He expressed the hope that Derby and district people would give the demonstrations their fullest support. Thanks to Mrs. Neal and the organizers were offered by Mr. P. J. Lupton (Divisional Officer for the Ministry of Food), who spoke of the need for such demonstrations at a time when food presented a difficult problem.

The demonstrations were given by Miss Beryl Abbey, assisted by two other members of the Derby Gas Company's staff—the latter being attired in blue overalls with bright red buttons to match the colour scheme of the kitchen display unit illustrated above. The layout of the "platform kitchen" was extremely attractive—as may be gauged from our photograph—and was carried out in a colour scheme of cream background with blue edging, with a bright red slogan suitably illuminated across the back. The equipment consisted of two gas cookers, a refrigerator, and two water heaters, all in working order. This platform arrangement elicited favourable comment from the Civic Authorities who supported the effort.

The total attendances for the four sessions was over 1,200, and as the invitations were all personal and entry to the hall strictly limited to ticket-holders, it is safe to assume that the audiences were different on each occasion. The Company believe that the demonstrations have greatly enhanced their prestige in the district, which is borne out by the considerable publicity and favourable comment in the local Press.

It may be observed that the Derby Gas Light and Coke Company have been very actively engaged in wartime cookery demonstrations in conjunction with the Townswomen's Guilds in Derby and the Women's Institutes in those parts of Derbyshire within their area of supply. Upwards of 25 such demonstrations have been arranged for organizations of this kind since January.

Trade News

Laboratory Equipment

Some interesting new productions are described in a series of pamphlets just issued by Griffin & Tatlock, Ltd., of Kemble Street, W.C.2. The G.L.C. constant volume gas analysis apparatus has been developed as the result of 12 years' experience in the Fulham laboratory of the Gas Light and Coke Company. It is a modification of the Bone and Wheeler apparatus, giving added convenience and rapidity for the accurate analysis of practically any gaseous mixture. The Microid gas generator displaces the Kipp's Apparatus imported in pre-war days from Germany, and is easy to fill and recharge, contains no ground glass joints, and delivers gas up to a pressure of 18 cm. water; spare parts are always available. The Microid lever balance, designed for rapid, rough weighing in works, research and school laboratories, is a weightless instrument which automatically indicates weights up to 200 grams with an accuracy of 0.5 gram. Another new production is the streamlined hydrometer, a new cylindrical bulbed type of higher accuracy, greater robustness, more rapid reading and easy-clean shape. "Pyrex" brand sintered glass filter apparatus is also described in an 8-page catalogue.

Emergency Power Plant

The possibilities of breakdown in power supplies under wartime conditions have been anticipated at many works, where Crossley Diesel engined emergency power and lighting plants have been installed, either for complete change-over, or for the maintenance of essential services and operations. A selection of such installations is described in the latest number of "Crossley Chronicles" issued by Crossley Brothers, Ltd., Openshaw, Manchester. Interest is added to the publication by the fact that most of the installations dealt with are somewhat special arrangements rather than straight power and lighting sets. Among the large number of emergency outfits of varying type and size already supplied are a 225 b.h.p. engine coupled to an A.C. generator in the basement of a large newspaper office; three 84 b.h.p. vertical Diesels coupled to generators for a municipal electricity department, a 90 b.h.p. Diesel coupled to a generator at a Post Office, and a 28 b.h.p. two-cylinder vertical Diesel direct coupled to generator, for the Office of Works.

Precision Made Instruments

Escapements, synchronous clock movements, industrial clocks and mechanical time lags are described and illustrated in a new folder from Rotherham and Sons, Ltd., Coventry, who point out that the scope of the publication is limited by the fact that many of the delicate mechanisms they are making to-day are confidential and cannot be described. Products of the company's instrument division occupy one half of the folder, and in the other half the engineering division gives details of its oil indicators, lubricators, petrol taps, filters, gear pumps and solderless unions. An interesting item is the "Ki-Gass" petrol mist injector for ensuring easy starting from cold. The injector instantly and automatically vaporizes the petrol and prevents accidental prolonged running on too rich a mixture since it obviates the need for "choking" the carburettor.

A New Acid-Resisting Cement

An entirely new material, Sankey's Super acid-resisting cement, has just been put on the market by J. H. Sankey and Son, Ltd., Ilford, as the result of prolonged research. The cement, which is supplied in a fine powder and has to be mixed with Sankey's acid resisting solution, withstands attack by all acids, hot and cold, with the exception of hydrofluoric. It cannot be disintegrated by, and permanently resists, sulphuric, hydrochloric, nitric, and phosphoric acids, or mixtures of any of them, and all organic acids, including acetic, formic, lactic, citric, and tartaric. The mixing is done simply and quickly, and the plastic cement is applied in the usual way for jointing, pointing, patching, and rendering. It adheres strongly to brick, tile, earthenware, stone, concrete, and iron surfaces. In 12 hours after application the cement sets to stone hardness and there is no contraction, cracking or crumbling. It is highly heat-proof and remains unaffected by temperatures up to approximately 1,200° C. It also has good waterproof properties and is very suitable for outdoor work.

Coal Storage

The problem of coal storage has confronted gas executives for many years. It has had its protagonists and objectors and many a discussion has failed to settle the case, one way or the other. With the development of hostilities the Government have now come down on the side of those in favour of stocking. Now the question to be asked is, how do we reclaim at the least expense? There are few whose original storage accommodation is adequate as owing to shipping curtailment and railway uncertainties all available space must be used. This is where the Chaseside Shovel is proving its utility, besides all the other jobs on a gas-works that it can economically undertake. Coal reclaiming is in many cases a practical proposition. Two hundred tons of coal per day are well within its scope and then the machine can be handed over to a relief driver for other duties. Over fifty gas undertakings in Great Britain and overseas have proved this, and the repeat orders placed confirm their satisfaction.

THE FEDERAL IDEA APPLIED TO THE GAS INDUSTRY

Paper prepared for the Eastern Counties Gas Engineers' and Managers' Association

By
W. T. HALLAM,
Distribution Controller, Bedford District Gas Company

"Federal Union" stands for a great commonwealth of free peoples made up of nations who wish to manage their own affairs in their own way, but who are prepared to transfer to a common government the management of matters which concern them all.

The Federal system is already working in the United States of America, Canada, Australia, the Union of South Africa, Switzerland, and Soviet Russia. America developed the Federal idea in the eighteenth century, and the machinery which they devised for its application has made it possible to extend the government of, by, and for the people over an area which they never contemplated in the first instance. The suggestion now is to develop our civilization by combining and applying the systems of representative government and federalism to some of the national States of the world so that ultimately the whole area will have a common and permanent system of government.

The British Gas Federation was constituted in 1934, and embraces the following National Gas Bodies: The National Gas Council, the British Commercial Gas Association, the Institution of Gas Engineers, the Gas Companies Protective Association, and the Society of British Gas Industries. Its first and principal object was to promote the interests and welfare of the Gas Industry. This is the same object as I have in view, and I think that all that is necessary is to reconstitute the existing Federation so that it would have the power to enforce any recommendations agreed on by the majority of the members. We desire to manage our own affairs in our own way, but I think we should all be willing for a national body properly representing the views of the whole Industry to manage national affairs or those which affected us all.

Just three examples will be sufficient to consider: (1) A standard calorific value; (2) standard prices of appliances; (3) gas traction. The first has been debated many times, and there is apparently no reason why there should not be a standard value all over the country.

The varying prices of appliances make difficulties for the manufacturers, and I know from personal experience create suspicion in the minds of our consumers.

If every gas undertaking in the country had put down a filling station, either in its own works or in a garage, there would have been thousands of gas-propelled vehicles on the road to-day where there are now only hundreds. This idea can only become popular or possible if every gas undertaking provides the means for refuelling vehicles. A commercial traveller friend of mine who travels the surrounding district could, I feel sure, utilize gas if he could be certain of obtaining supplies at, say, Woburn, Leighton Buzzard, Dunstable, Buckingham, Fenny Stratford, St. Neots, Sandy, Biggleswade, Huntingdon, Cambridge, Northampton, Kettering, Rushden, Peterborough, Luton. So far as I know the only place he could get gas other than Bedford is Luton, therefore the very people—that is, travellers—who would have been glad to use gas are unable to do so.

Mr. T. A. Wolfe, in a Paper read before the London & Southern Junior Gas Association on Jan. 24, 1936, said: "The last matter I should like to call your attention to is the crying need in our Industry for more and more and more standardization in policy and practice." He suggested a number of items which should be dealt with from a national point of view, and finished up: "When one considers the diversity of opinions and practice it does seem to indicate that a permanent advisory body under the aegis of The Institution of Gas Engineers might be kept usefully employed, which could deal with many of the anomalies which are so confusing to consumers." Mr. Wolfe suggested those matters which affect us all should be dealt with on a national basis by an advisory body, and that, I think, is our weakness

Our present constitution or control is similar to the League of Nations, the failure of which was due to the fact that each nation retained its sovereign rights, and at no time could it exercise power in the same way that the Government of a national State does each day. I believe that the Federal Union can succeed where the League failed, and I believe that a reconstituted British Gas Federation would place the Gas Industry in a position which it will never attain by the present advisory methods. We can succeed if each gas undertaking is prepared to surrender its sovereignty. What are the alternatives? Nationalization? What we have seen of the electrical industry does not make us want to adopt this method. Another is the holding company movement, but even under this the local manager is left with sovereign powers.

I imagine every manager of every undertaking in this district is a member of this Association, or could be if he wished, whereas he might not be a member of The Institution of Gas Engineers. In the British Gas Federation this Association and the other district Associations are not represented as such, and I suggest that they are suitable units from which representatives of the gas undertakings could be drawn for a Federal Council.

This is the only proposal I have to make for the new Federation.

BENZOLE RECOVERY

By L. R. COWLEY,
Cheltenham and District Gas Company

In the course of a Paper at a meeting of the Western Junior Gas Association on May 15, Mr. L. R. Cowley, Works Engineer and Manager, Cheltenham and District Gas Company, referred to the question of benzole recovery.

Several Papers, he remarked, have been written on the recovery of crude benzole from coal gas, and long and heated arguments have been entered into respecting the economics of this process. I can state that as far as Cheltenham is concerned, benzole recovery has completely justified its installation.

Our plant was installed in 1936, and comprises a static washer rated at a capacity of 3½ million cu.ft. per day, an oil preheater, heat exchangers, oil coolers, still dephlegmator and fractionating column, naphtha separators, and benzole condenser and separator. An extraction of 2 gallons of crude benzole per ton has been maintained throughout the life of the plant.

The washing medium is spindle oil, which is generally accepted as less liable to trouble from sludge formation than, for example, gas oil. Actually, for the first two years we had no indication of this trouble, and fondly imagined we were going to be fortunate enough to be free from it. However, the usual signs eventually began to give warning that sludge had not completely passed us by.

We were anxious, however, that so far as possible, the benefits to us of oil washing should not be completely lost even while the recovery plant was out of commission for cleaning. In no small measure did the extraction of naphthalene influence our thoughts this way. It was therefore decided to continue washing by arranging to by-pass the recovery plant. Since this has been done, we have shut down the distillation plant approximately once every six months for cleaning, and when I inform you that a plant originally designed for an oil flow of 800 gallons per hour is still doing 900, it will be realized that our policy is justified.

As an average, we find it necessary to remove approximately 300 gallons of oil-laden sludge each time we clean out the plant. With reference to oil replacement, our figures over a period of three years are 0.027 gal. of oil per gal. of crude benzole recovered.

In addition to the financial benefits accruing from the sale of crude benzole, we consider the extraction of naphthalene incidental to the recovery of crude should be accounted on the credit side of the balance sheet when assessing the economics of installing a plant. As a naphthalene washer in conjunction with benzole recovery, we consistently reduce the concentration of naphthalene in the gas from 5 grains per 100 cu.ft. at the inlet of the washer, to 0.5 grains at the outlet.

Removal of Sulphur Compounds

For some time we have been giving thought and attention to the removal of sulphur compounds from our gas. The quantity of sulphur compounds at the inlet to benzole plant is of the order of 33 grains per 100 cu.ft., and when recovering approximately 2 gallons of crude benzole per ton the content of the gas at outlet of washer a year ago was around 27 grains per 100 cu.ft. It is well established that, given proper cooling, the oil-flow/gas-flow ratio is a vital factor where removal of CS_2 is concerned.

According to some tests which were carried out in May, 1939 (at Cheltenham), it was shown that with a gas make of 91,000 cu.ft. per hour, our oil/gas ratio was 44 gallons per 10,000 cu.ft. At that date the plant would effectively strip 500 gallons per hour, and as we had on several occasions during 1938 to make 4 million cu.ft. per day—*i.e.*, 167,000 cu.ft. per hour had to pass through the washer—the oil/gas ratio was reduced to 30 gallons per 10,000 cu.ft. Now for the reduction of the organic sulphur content in the gas by 45% the oil/gas ratio must be 150 gallons per 10,000 cu.ft. at 20° C. This meant an oil circulation of 2,500 gallons per hour on a make of 167,000 cu.ft. per hour. To reduce the organic sulphur content by 80%, the ratio would have to be 300 gallons per 10,000 cu.ft. Under the given condition of 4 million cu.ft. per day make, this meant a flow of 5,000 gallons of oil per hour. These conditions were in our case impossible to attain; even if we had been able to cool this quantity of oil—we were still faced with the fact that the size of the still precluded any possibility of stripping this quantity of oil.

So any hope of further reducing the sulphur content of our gas with existing conditions had to be abandoned. Certain minor alterations, however, were made to the plant, and an additional rack type cooler was erected in parallel with existing oil cooler,

and these have enabled us to maintain a flow of 900 gallons per hour. Actual average figures for March, 1940, show a sulphur content of 20.4 grains per 100 cu.ft. at benzole washer outlet, with an oil/gas ratio of 90 gallons per 10,000 cu.ft.

As the corresponding sulphur content figure for March, 1939, was 27.2 grains per 100 cu.ft. with an oil/gas ratio of 50 gallons per 10,000 cu.ft., we felt satisfaction in achieving even this small reduction.

A Centrifugal Separator

In an attempt to reduce the sludge carried to the washer, an experimental centrifugal separator was made. This consisted of a hollow truncated cone, set inside an outer conically-shaped vessel, both inverted. The oil was led to the top of the outer cone and made to take a spiral path around the inner cone, and at the apex of the outer cone the oil was caused to rise through the inner cone, provision being made at the apex of the outer cone to drain off any settlement which might take place through the centrifugal action and the sudden change in direction of flow. From the point of view of collection of sludge, this was not highly successful, but it was, however, possible to drain off small quantities of water.

Direct measurement of steam required for the recovery of crude benzole has been made continuously by means of a Bailey steam meter. For the recovery plant only, the quantity of steam expended per gallon of benzole during 1939 was 42.1 lb. As our oil circulating pumps are electrically driven, this figure does not, therefore, include steam used for power. Obviously this figure was increased where oil flow was increased, but no figures are available as to the extent.

Our efforts to reduce sulphur compounds were not enough for us, so we have decided to install a complete new benzole and desulphurizing plant, capable of dealing with 3 million cu.ft. per day. Working this plant in parallel with the existing one, on which we are again increasing the cooling capacity, it will be possible, we hope, to arrange for a sufficiently high oil/gas ratio to ensure the reduction of sulphur content at the outlet of the plant to 10 grains or less.

Gas Undertakings' Results

Buckhaven and Leven

Satisfactory increases in the number of consumers and of gas appliances in use are recorded by the Buckhaven and Leven Gas Commissioners. The quantity of gas made during the twelve months ended May 15 has been approximately 174,000,000 cu.ft., which is a reduction of nearly 9,000,000 cu.ft. when compared with the make of the preceding twelve months. As a matter of fact, the consumption of gas through ordinary and prepayment meters actually shows an increase of nearly 3,000,000 cu.ft.; the smaller quantity made being explained by a reduction in the unaccounted-for gas by over 4,000,000 cu.ft., and of 7,000,000 cu.ft. through the absence of public lighting during the winter. This points to the high unaccounted-for gas figure of previous years having been attributable to a large extent to undercharge on the quantity of gas used in public lamps.

Carlisle

In spite of the fact that, as compared with the preceding year, approximately 40 million cu.ft., have been lost in public lighting, there was an increase of over 5 million cu.ft. in the total sales of the City of Carlisle Gas Department during the twelve months to March 31 last. The actual figures are : 1939, 644,480,000 cu.ft.; 1940, 649,888,500 cu.ft. Sales of appliances show a slight decrease of 3½%. During the year there has been an increase of 287 in the number of consumers, to 20,888, of which total 15,921 are on the prepayment system. The average consumption over the past year by ordinary meter has been 58,349 cu.ft., and by prepayment meter 21,430 cu.ft. After providing for income-tax, loan repayments, &c., there is a net profit of £4,124, which compares with £998 for the preceding twelve months.

Coventry

The quantity of gas sold by the City of Coventry Gas Department during the past financial year has been 2,823,045,000 cu.ft., which compares with 2,832,336,000 cu.ft. for the twelve months to March 31, 1939. The decrease is much more than accounted for by the reduction in consumption for public lighting, which on the present occasion figures at 46,308,199 cu.ft., as against 131,693,133 cu.ft. a year ago. The quantity sold through ordinary meters increased from 1,590,734,120 cu.ft. to 1,665,479,910 cu.ft., and the prepayment meter consumption from 1,109,908,400 cu.ft. to 1,111,256,500 cu.ft. The number of meters in use increased during the year from 75,589 to 78,410. On the financial side, the result of the year's operations is a deficit of £18,435, in place of a net profit of £1,468 for the preceding year.

Holyhead and North Wales

An increase in gas sales of 5,874,700 cu.ft. during the twelve months to March 31 is reported by the Holyhead and North Wales Gas and Water Corporation, Ltd., who operate eight works in their district. The actual sales have been 103,597,300 cu.ft., which compares with a total of 97,722,600 cu.ft. in the preceding twelve months. The net profit for the year is nearly £300 up at £4,744. As last year, the dividend is at the rate of 5%, together with the transfer of £1,000 to Reserve Fund Account.

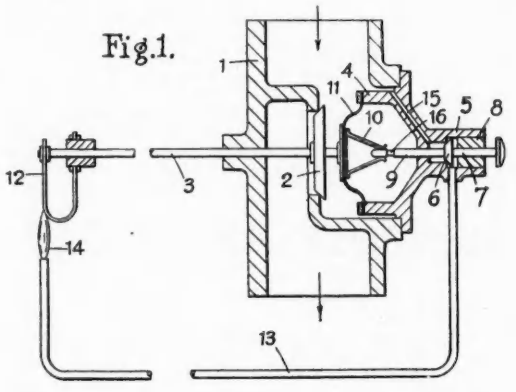
Safety Cut-off Device

The subject of a patent (No. 521 232; application date, Nov. 14, 1938) granted to F. O. Horstmann and the Horstmann Gear Co., Ltd., is a gas safety cut-off valve. Fig. 1 shows a vertical section of the device.

The passage through a gas supply conduit 1 to the main burner is controlled by a poppet or other lift type of valve 2 which is fixed to an operating spindle 3 mounted in and slidable at right angles to the axis of the conduit 1. In one wall of the conduit adjacent the main valve and on the supply side of the latter there is formed an opening which is closed by a hollow cap or plug 4 terminating in a central sleeve-like housing and valve chamber 5 for a pilot valve 6 of a type similar to but smaller than the main valve and disposed co-axially therewith. The operating spindle to which the pilot valve is fixed, projects, at one end 7, through a stuffing gland 8 which closes the end of the housing 5, and, at the other end 9 projects towards the main valve and engages between springy fingers 10 projecting from the inner end of the spindle of the main valve. This inner end terminates in a flange or disc which serves to clamp a diaphragm 11 thereto, this diaphragm extending across the chamber in the plug 4 and having its periphery secured to the wall bounding the chamber. The outer end of the main valve spindle extends outside the wall of the conduit 1 and has its extremity connected to one end of a U-shape bi-metallic strip 12, the other end of which is secured to a fixed member, which may be the end of a tube surrounding the main valve operating rod and carried by the main valve housing or conduit. A by-pass tube 13 leads from the pilot valve housing to a pilot jet 14 which directs a flame on to the bottom of the bi-metallic strip and preferably on that leg which is connected to the main valve operating spindle. A gas passage 15 leads gas from the supply through the cap to the pilot valve.

The device constructed as above described functions as follows: When both main and pilot valves are closed, the pilot valve may be opened manually by pulling its operating spindle 7 outwardly—the outwardly projecting end of the latter is provided with a suitable knob or handle for the purpose. The end of the other

Fig.1.



part 9 of the pilot valve spindle slips through the springy fingers, as the mass and mounting of the main valve 1 resists movement and enables the parts of the clutch comprised by the elements 9 and 10 respectively to slip. When the strip is heated sufficiently, the resulting contraction will move the main valve operating spindle axially and towards the pilot valve to cause the main valve to open, the fingers 10 sliding along the spindle 9 (as the valve 6 is hard against the stop formed by the gland 8). When the main valve is open the ends of the springy fingers may engage in a circumferential recess 16 in and slightly spaced from the extremity of the end of the pilot valve operating spindle or may slip past the recess. The recess is provided to ensure a positive engagement of the clutch elements on the return movement. This engagement of the springy fingers provides a friction gripping and slipping connexion between the two spindles 3 and 9, so that should the pilot burner be extinguished due to its being blown out, or to cutting off of the supply at a point preceding the device, the resulting shutting of the main valve as the thermal strip cools will draw the pilot valve to the closed position and thus the gas supply to the pilot is cut off. The lighter pilot valve is pulled by virtue of the clutch elements 9 and 10 when the main valve closes. The pilot valve and the main valve can be shut at any time merely by pushing the pilot valve operating spindle inwardly. Shutting of the pilot valve extinguishes the pilot flame and thus causes the main valve to close due to cooling of the thermal strip.

The employment of the diaphragm 11 and the hollow cap 4 which forms an air chamber behind the latter, enables the pressure on the back of the main valve to be balanced, and thus ensures easy and certain operation of the device.

(A further specification abstract will be found on p. 636.)

GAS LIQUOR DISTILLATION*

By F. H. PEAKIN

Reprinted from the Journal of the Society of Chemical Industry. We are indebted to the Editor of the Transactions for the loan of the blocks used for illustrating the Paper

THAT the recovery of by-product ammonia is an important industry in this country, in spite of the challenge which has come from the production of ammonia from atmospheric nitrogen, is shown by the following figures:

AMMONIUM SULPHATE.

World Production in 1,000 tons.

Year.	By-product.	Synthetic.
1925	1,540	1,630
1935	1,710	6,000

England and Wales Production in 1,000 tons.

Year.	Gas-Works.	Coke oven and Synthetic.
1930	143	570
1938	119	558

A direct comparison of synthetic production with by-product is not available, but in recent years it may be taken as approximately true that synthetic ammonium sulphate constitutes about half of the total for this country.

Although the figures show a large production, this represents only a fraction of the potential output from the coal carbonized in the retorts and coke ovens of this country. The fact that gas liquor can now be concentrated in a simple automatic plant, and the ammonia sold profitably to a suitably placed fertilizer works, has recently had much publicity. The whole subject has been well summed up by Parrish[2, 12].

That ammonia from coal distillation should not be wasted was obvious in peace time; that it is of vital importance now in time of war should need no emphasis.

The first portion of this Paper is more particularly concerned with the "indirect" process of ammonia recovery, that is, the process in which ammonia is scrubbed out of coke oven or town gas by water. Many coke oven plants remove the ammonia by scrubbing with sulphuric acid, giving rise to the term "direct" recovery of ammonium sulphate.

The gas liquor obtained from gas scrubbing may be used for one of several purposes—viz., for the production of (1) ammonium sulphate, (2) aqueous solutions of pure ammonia, (3) concentrated gas liquor for sale to a centrally situated fertilizer works, or (4) ammonium carbonates. Common to all these uses is the essential step of dissociating the ammonia content from the liquid phase and recovering it from the gaseous phase—in other words, gas liquor distillation.

The Modern Continuous Still

In modern continuous stills for gas liquor, the liquor is fed to the top, where it descends a series of bubbling trays; live steam enters at the base and in ascending strips the volatile components. The upper section is of such a length that removal of carbon dioxide and hydrogen sulphide is complete at this stage, while not much ammonia is removed. The decarbonated liquor is then diverted to the lime-mixing vessel and returned to the still for completion of the stripping. The effluent leaves at the boiling point. The gases, ammonia, carbon dioxide, and hydrogen sulphide, mixed with steam leave at the top and pass to the saturator for ammonium sulphate manufacture, or to condensers for concentrated liquor. The incoming liquor is preheated as much as possible by heat exchange with these gases.

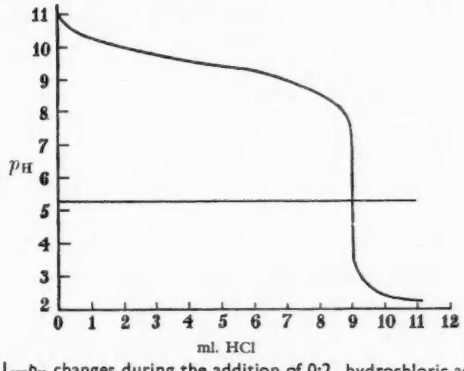


Fig. 1—p_H changes during the addition of 0·2$_N$-hydrochloric acid to $_N$-ammonia solution

Gas liquor is commonly said to contain both "free" and "fixed" ammonia, the "free" consisting of ammonia itself and ammonium carbonates, hydrosulphide, and other easily dissociable salts and the "fixed" of chloride, sulphate, &c., which are not so readily dissociated by heat. Thus "free" and "fixed" are not terms of any absolute significance but refer to the ammonia which will come off easily on boiling and that which will not.

Fig. 1 shows what happens in a solution of ammonia when an acid such as hydrochloric is added. The p_H falls steadily at first because of the well-known weakening of the alkalinity of ammonia by ammonium salts, and then at last falls extremely quickly as the end-point is reached; a suitable indicator such as methyl-red would respond to this sudden change. The lower portion of the curve represents the addition of acid to a solution of ammonium chloride.

A clearer picture of what is free and what is fixed ammonia can now be obtained: if a solution of ammonium compounds sets up a p_H higher than 5.3 at room temperature, then it can be said that there is some free ammonia present.

The application of the above simple example to the much more complex mixture of ammonium salts in gas liquor will now be considered. Fig. 2 shows the p_H changes which occur when gas

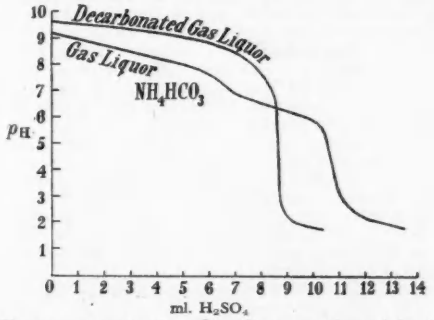


Fig. 2—Electrometric titration of gas liquors with $_N$-sulphuric acid

liquor is treated with a strong acid. This curve differs from that of Fig. 1 in that it shows two kinks, the first one being due to ammonium bicarbonate. As this occurs at a p_H well above 5.3, it can be said that the ammonia in ammonium carbonate is not fixed. Precisely the same argument applies to ammonium hydrosulphide, another principal constituent of gas liquor. An even more important fact is that hydrogen sulphide and carbon dioxide, being gases, can be removed from the sphere of reaction by heat, so that the dissociation of their ammonium salts can go to completion. The physical basis for this is shown in Fig. 3; these curves

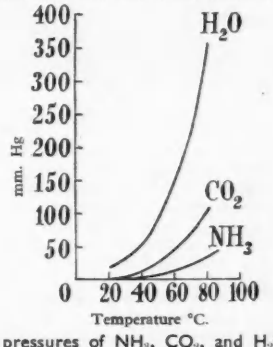


Fig. 3—Partial pressures of NH_3, CO_2, and H_2O over a 0·295$_M$. solution of ammonium carbonate (Terres and Weiser)

have been constructed from the work of Terres and Weiser,[1] and they show how the partial pressures of water, ammonia, and carbon dioxide over a solution of ammonium carbonate vary with temperature. It is clear from these curves that the vapour pressure of carbon dioxide rises much more steeply with temperature than that of ammonia, or, in general language, carbon dioxide will distil off from gas liquor at a greater rate than the ammonia.

It is not proposed to deal further with this aspect of the subject, for the process of decarbonation as a preliminary to gas liquor distillation is very well understood; so also is its complementary process, the so-called "vapour-phase decarbonation,"[2] in which ammonia solution is preferentially condensed at a controlled temperature, leaving the bulk of the carbon dioxide still in the vapour phase. It is of interest, however, to examine the titration curve of a gas liquor which has been partly dissociated to remove almost the whole of the carbon dioxide (see Fig. 2). The first inflexion due to carbon dioxide is now absent.

Returning to the definition of what is free ammonia and what is fixed, it can be seen that if gas liquor is boiled, carbon dioxide and hydrogen sulphide will be evolved together with a little ammonia, and then ammonia will be evolved in increasing amounts as the temperature rises. Removal of ammonia, of course, means a loss of alkalinity, and in effect this titration curve (Fig. 2) is followed downwards until p_H 5.3 is reached. At this point all the

* Read before the Birmingham and Midland Section of the Society of Chemical Industry.

free ammonia has been distilled off, leaving a neutral solution of ammonium chloride and similar salts. It should be pointed out that this is subject to the proviso that the neutral point is p_H 5.3 at the boiling point as well as at room temperature, at which determinations were made. It probably is not the same; this point will be dealt with later, but if all p_H measurements are referred to room temperature, this is not of importance.

Liming

At this stage some works throw away the rest of the ammonia, which usually constitutes 20-35% of the whole. They do this in order to avoid the complication of liming to free the rest of the ammonia, because this is not easy to carry out in an automatic manner.

There are several arguments, chiefly economic, in favour of recovery of the fixed ammonia, but there is also the important one that the ratio of ammonia to carbon dioxide in the concentrated gas liquor, if this is being made, is higher, and less rigorous decarbonation is then necessary to avoid crystallization of the product in storage.

From the viewpoint of hydrogen-ion concentration the process previous to liming consists in passing down the curve (Fig. 2) until all the ammonia is fixed as ammonium salts below p_H 5.3. Addition of the alkali (lime) in the form of $Ca(OH)_2$ will raise the p_H and enable the ammonia to be removed by steam. The progressive addition of lime, of course, is represented by retracing the curve in the opposite direction, and no complications are apparent from this diagram.

In practice, however, there is a different set of conditions. Gas liquor contains not only chloride ions, but also those of weaker acids such as phenol, thiosulphuric and hydrocyanic acid, as well as carbon dioxide introduced in the commercial quicklime. The effect is to give a solution which is strongly buffered, so that the system is not a simple one which is either strongly alkaline if there is enough lime, or at p_H 5.3 if there is not. The effect of the large concentration of calcium salts on the alkalinity of the solution is illustrated in Fig. 4. The sample consists of the effluent from a gas liquor still which has been limed and stripped of ammonia. The

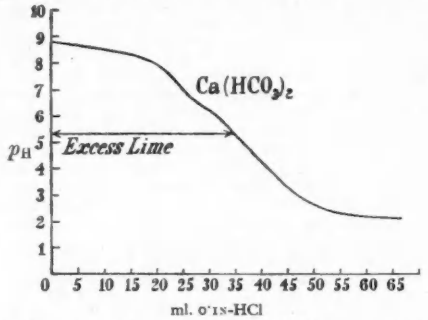


Fig. 4—Electrometric titration of effluent from ammonia still

alkalinity of this solution is due then to lime, of which, in practice, it is convenient to use an excess. The gentle slope of the curve indicates the buffering which has been mentioned, while the small kink indicates the presence of some calcium bicarbonate. The important point here is that once the desired p_H of 5.3 is ensured, addition of further lime does not produce a steep rise of p_H.

It is necessary in controlling a liming still to ensure on the one hand that enough lime is present to free all the ammonia, and on the other to avoid undue excess of lime, which is wasteful. It is the practice in some works to determine the excess of lime by titration with standard acid, using phenolphthalein to indicate lime in the rather highly coloured solution. As phenolphthalein does not start to change colour until p_H 8.3, this method may involve working at an unnecessarily high p_H, and so wasting lime. A better estimate may be obtained with a more suitable indicator, but it is not easy to follow the colour change in the dark effluent. The most reliable method, of course, is to distil a sample of the effluent with the addition of some ammonium salt, which will release ammonia equivalent to the free lime. The ideal to be aimed at, as a means of control, is accurate recording of the p_H of the effluent, which will be mentioned later.

Steam Requirements

So far the only problem dealt with has been to get all the ammonia into the free state, without considering how readily the ammonia will be released by different proportions of lime, or, more precisely, how the partial pressure of ammonia varies with the p_H of the solution. If this question were not examined, there might appear to be excellent reason for substituting chalk for the more expensive lime. Fig. 5 shows the value of chalk as an alkali. If chalk is suspended in cold water and titrated with sulphuric acid, the carbon dioxide is capable of exerting its effect on the p_H, and an inflexion appears at the half-way stage, calcium bicarbonate. If the mixture is boiled after each addition (and cooled again for each reading) the upper curve results and the p_H remains steady until the end. This p_H of 7.6 is that set up by chalk, and if the fixed ammonia is boiled with an excess of chalk, the system is alkaline enough to expel all the ammonia. However, the evolution of ammonia is rather slow, and that raises the question of vapour pressure of ammonia over the limed liquor. The importance of this has been stressed by Parrish,[3] who has done much of

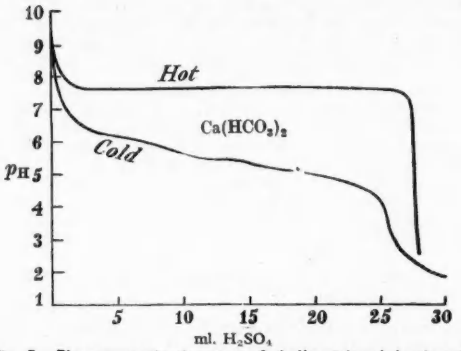


Fig. 5—Electrometric titration of chalk with sulphuric acid

the pioneering work in modern methods of gas liquor distillation; he quotes some determinations by Piron,[4] to which reference will be made later.

Henry's Law

In attempting to apply Henry's law to ammonia solutions, difficulties are encountered. The law states that m/p = constant, where m is the mass of gas dissolved in a solution and p is the gas pressure. Expressed in terms of concentrations, $C_1/C_2 = K$, where C_1 and C_2 are the concentrations of the dissolved substance in the gaseous and liquid phases.

Fig. 6[5] shows the result of applying Henry's law to Roscoe and Ditmar's[6] and Sim's[7] results. If the law were obeyed a straight line, such as the dotted one, would be obtained. At low tempera-

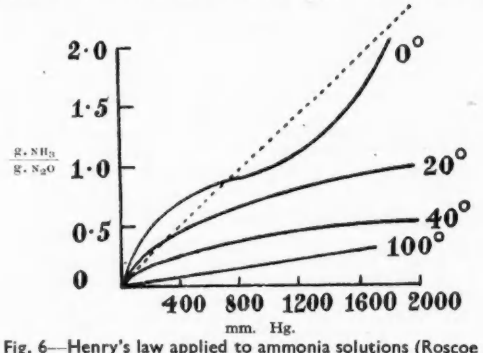


Fig. 6—Henry's law applied to ammonia solutions (Roscoe and Ditmar)

tures the law fails to interpret the results, presumably because of reaction between the ammonia and the solvent, but at 100° there is quite a reasonable approach to a linear relationship, and, of course, this is the technically important case for the distillation of gas liquor.

This has been examined by Calingaert and Huggins,[8] whose results are shown in Table I. The simple calculation gives a falling value for K, but when correction is made for the fact that some of the dissolved ammonia ionises to ammonium ions, a quite satisfactory constant is obtained.

It may therefore be concluded that Henry's law holds with sufficient accuracy at 100° to be applied to the theory of gas liquor

TABLE I.

Henry's law applied to ammonia solutions : 100°.
(*Calingaert and Huggins*)
C in grams NH_3 per litre. α = dissociation constant of NH_4OH.

C_2		$K = \frac{C_1}{C_2}$	$1 = \alpha$	$k = \frac{C_1}{C_2(1 - \alpha)}$
1·256	...	12·92	0·987	13·1
0·633	...	12·67	0·981	12·9
0·305	...	12·44	0·973	12·8
0·148	...	12·13	0·963	12·6
0·0386	...	12·06	0·926	13·0
0·0190	...	11·83	0·896	13·2
0·0107	...	11·53	0·864	13·3
0·0046	...	11·05	0·806	13·6

distillation. It is also noticed that ionization of the aqueous ammonia has an effect, which might be expected to be influenced in turn by the p_H of the solution.

[1] J. Gasbeleucht., 1920, **63**, 705. *See also* Pexton, Badger, and Silver, J.S.C.I., 1938, **57**, 106.
[2] Parrish, Kitching, and Burns, B.P. 494,023. Key *et al.*, Inst. Gas Eng., Comm. 168, **1937**.
[3] Inst. Gas Eng., Comm. 213, 1939.
[4] Chem. Met. Eng., 1922, **26**, 317.
[5] Taylor, "A Treatise on Physical Chemistry," p. 349. Macmillan, **1924**.
[6] Annalen, 1859, **112**, 349.
[7] *Ibid.*, 1861, **118**, 345.
[8] J. Amer. Chem. Soc., 1923, **45**, 915.
[1-2] Inst. Gas Eng., Comm. 226, 1940.

(*To be continued.*)

Company Meeting

MALTA AND MEDITERRANEAN GAS COMPANY, LTD.

The Annual Ordinary General Meeting of the Malta and Mediterranean Gas Company, Ltd., was held at the London Offices of the Company, 5, Great Winchester Street, Old Broad Street, E.C.2, on Wednesday, June 12, 1940—Mr. A. M. PADDON, M.Inst.C.E. (Chairman of Directors), presiding.

The SECRETARY AND GENERAL MANAGER (Mr. G. Murray Burton, M.A., F.C.A.) read the notice convening the meeting together with the report of the Auditors. The Directors' Report and Statement of Accounts for the year ended 31st March, 1940, were taken as read.

THE CHAIRMAN'S ADDRESS

The CHAIRMAN, in moving the adoption of the Report and Accounts, said they would not expect a lengthy statement from him in the present circumstances. The Report and Accounts as presented were almost entirely qualified by what had happened since they were prepared, of which shareholders would be fully cognizant. Moreover, the period under review referred to two half-years—one before the war and one under war conditions—which made figures of very little value for purposes of comparison.

A few of the outstanding figures were that the gas sold was 9.27% less than in the previous year—which was to be anticipated having regard to the circumstances which had obtained in Malta. The balance of profit from Revenue Account showed a decrease of £243, while the carry-forward was reduced by £1,489. In the Balance Sheet the interesting figures were that while the market value of their investments stood at £83,760, their capital liability was only £73,845, leaving a balance of nearly £10,000 as a margin in their favour. They had, however, since realized a further £5,000, which they would understand was called for in connexion with the operations of the Company by way of working capital. Therefore, these assets exceeded the Issued Capital by £5,000, which they would agree was very satisfactory.

He could not say anything regarding the future except that they had bought and received their coal supplies for twelve months ahead, which was also satisfactory. In regard to almost every other detail, however, matters must remain in abeyance. They all knew how precarious things were at the present time, and he knew they would not ask him to forecast them in any way.

The CHAIRMAN then formally moved the resolution for the adoption of the Report and Accounts, which was seconded by Mr. A. W. OKE, M.A., LL.M., and carried unanimously.

Dividends

The CHAIRMAN thereafter moved:

"That Final Dividends at the full rates on the First and Second Preference Stock and a Dividend of 4% (free of income-tax) on the Ordinary Stock be declared, making for the year (with the Interim Dividend paid in December last) a total distribution of 7% on the First Preference Stock, 7½% on the Second Preference Stock, and 8% (free of income-tax) on the Ordinary Stock."

This was seconded by Mr. FRANK H. JONES, M.Inst.C.E., and unanimously agreed.

Re-election of Director and Auditors

The CHAIRMAN moved the re-election to the Board of Brig.-General G. V. Clarke, C.M.G., D.S.O., being the Director retiring by rotation. They were indebted to him, observed the Chairman, for accepting office in the present circumstances, it was not a very pleasurable responsibility at such a time.

The resolution was seconded by Mr. E. L. BURTON and carried unanimously. Brig.-General CLARKE briefly returned thanks.

On the proposition of Mr. F. R. SMITH, seconded by Mr. L. TREWBY, Mr. Hyde C. Burton, F.C.A., and Mr. William Cash, Jnr., M.A., F.C.A., were appointed the Company's Auditors for the ensuing year.

This concluded the business of the Ordinary General Meeting.

EXTRAORDINARY GENERAL MEETING

At an Extraordinary General Meeting which immediately followed approval was given to the following Special Resolution, which was moved by the CHAIRMAN and seconded by Mr. A. W. OKE:

That the Articles of Association of the Company be altered:

By deleting Article 110 and substituting the following new Article:

"110. Any sum paid on behalf of the Company which shall amount to £5 or upwards shall, so far as practicable, be paid by cheque, draft or order on the Company's bankers and no such payment shall be made without the order or authority of the Board or of a committee of the Board duly authorized by the Board in that behalf.

The Board may enter into any such arrangement with the Company's bankers in relation to the signing of cheques, drafts

A & M
Wet Leakage
METERS

★ We make wet leakage meters with Tinned Copper Cases and Block Tin Drums in various types for $\frac{1}{10}$th and $\frac{1}{12}$th revolution capacity. The meter shown is of the more expensive type with pressure gauge, graduated stop-cock, etc. We can give you plain Calorimeter type without final readings, glass door or pressure gauge.

ALDER & MACKAY LTD.

EDINBURGH - LONDON - BRADFORD & BRANCHES

and orders as it shall see fit and may from time to time vary any such arrangement."

Vote of Thanks

Mr. F. R. SMITH proposed a hearty vote of thanks to the Chairman and Directors which was all the more deserved in these difficult times. They must also sympathize very much with the staff in Malta. He had been in Malta four years ago, said Mr. Smith, when preparations for defence were in hand during the emergency in the Mediterranean at that time. He had the greatest pleasure in proposing this vote of thanks.

Mr. A. D. DODGSON seconded the resolution which was carried unanimously.

The CHAIRMAN, in acknowledgment, read out the following telegram which it was proposed to send to the staff in Malta:

"Stockholders and Directors send special message of thanks for work done under difficulties of past year, and now under fresh and intensified difficulties feel confident all those connected with the Company will carry on to utmost ability until successful outcome."

The proceedings then terminated.

LIVING ORGANISMS IN GAS PURIFICATION

From a Paper to a Joint Conference of the Production and Chemical Committees, American Gas Association

By

GILBERT E. SEIL,

Technical Director, E. J. Lavino and Co., Philadelphia

AS a matter of history, I applied for the first and, as far as I know, the only patent on a gas purification process in which bacteria are used to remove H_2S from illuminating gas. The number of the patent is 1,701,825, applied for on Dec. 26, 1925, and granted on Feb. 12, 1929. This interesting work was done for the Koppers Company, and the patent, of course, is assigned to that Company.

The idea from which the invention grew is interesting. In 1922 the railroads in Texas were having difficulty, where sulphur was being transported, with the heads on the spikes which hold the rails to the ties. Upon investigation it was found that the sulphur leaked through the cars and dropped on the wooden ties which were surrounded by earth. Cultures made from the earth showed that there were present several bacteria which fed on sulphur and liberated sulphuric acid. Before this time Dr. Jacob Lipman, Dean of the New Jersey State Agricultural College, now a part of Rutgers University, discovered that if he placed sulphur and tri-calcium phosphate in the soil and then impregnated the soil with certain bacteria, the bacteria would convert the sulphur to sulphuric acid which in turn converted tri-calcium phosphate to di-calcium phosphate, which can be assimilated by the plants as a source of phosphorus.

With this background, a study of the literature was made and several different types of bacteria were grown. Their characteristics in reference to H_2S, sulphur, and sulphur-oxygen compounds were carefully studied. Two methods of purifying gas by bacterial action were found. In the old Seaboard liquid purification process the actifier air can be easily cleaned of sulphur by scrubbing the actifier air with a suspension of bacteria. A simpler process is one in which the fouled gas itself is scrubbed with a suspension containing properly fed bacteria. In the first case aerobic bacteria can be employed. In the second case anaerobic bacteria can be employed. However, the proper bacteria must be selected.

Some of the characteristics of the bacteria tested in connexion with liquid purification are very interesting. The most interesting characteristic is that they live and thrive in dilute sulphuric acid solutions, and are active until the concentration reaches 5.2% H_2SO_4, which is slightly stronger than normal acid. At this point they become dormant, but they again become active in the presence of sulphur if the suspension is diluted with water or if a part of the sulphuric acid is neutralized, and they continue to work until the concentration of the acid again reaches 5.2% H_2SO_4. Suspensions of bacteria so concentrated were made that one litre of suspension consumed one gramme of sulphur or one gramme of H_2S per hour.

The equipment required for liquid purification of gas by means of bacteria consists of scrubbing towers, the number of which depends upon the particular type of process and the quantity of gas to be purified, and neutralizing vats to lower the concentration of the sulphuric acid in the system. It is also necessary to feed the bacteria, and means must be provided to furnish salts containing nitrogen, phosphorus, potassium, and other mineral salts as food.

In the Table below are tabulated the genera, common species, characteristics, and habitat of a group of higher bacteria which are especially active in changing sulphur.

SULPHUR BACTERIA.

A GROUP OF HIGHER BACTERIA WHICH ARE ESPECIALLY ACTIVE IN CHANGING SULPHUR.

	Genus.	Common Species.	Characteristics.	Found.	Notes.
Filamentous	Beggiatoa	Beggiatoa alba Beggiatoa minima Beggiatoa mirabilis Beggiatoa media	Long filaments which are actively motile. The thread also segments into many smaller units. The interior of these filaments may be seen to be filled with sulphur when the plant is growing in the presence of sulphur. In absence of sulphur supply, sulphur granules within the filament disappear.	These sulphur organisms are found in sulphur springs and stagnant pools where organic matter is in process of putrefaction.	
Filamentous	Thiothrix	Thiothrix nivea Thiothrix tenuis	Long threads, non motile, which are firmly anchored to the substratum by means of the sucker at one end of the thread. The threads are kept intact by means of a sheath.		
Non-Filamentous	Chromatium.	Chromatium okenii	They exist as free single cells, contain a red pigment called bacterio-purpurin, and store sulphur in their cells as a reserve substance, to use it only when the sulphur supply runs out in their environment.		These non-filamentous sulphur bacteria have been studied and confusingly named.
Non-Filamentous	Spirillum	Spirillum volutans Spirillum undula Spirillum sangvineum			
Non-Filamentous	Clathrocystis	Clathrocystis roseo persicina.			

From: "Bacteriology" by F. W. Tanner. Published by John Wiley and Sons, Inc. Third Edition (1937). pp. 250 and 251.

A National Effort Exhibition

The National Effort Exhibition, opened in Manchester by Lord Derby on June 6, provides striking evidence of the manner in which the nation is now speeding up its drive for victory—and how local authorities are co-operating.

Civil Defence Services, salvage campaigns, anti-gossip propaganda, and food education are all featured in the Exhibition. A special section is devoted to the activities of the Manchester Gas Department as typical of the work being done by similar departments of many local authorities in helping the prosecution of the war. This section includes a display of the by-products of gas-making which are key war materials; shells showing the improved quality made possible by heat-treatment by gas; and examples of the importance of this fuel to many industries.

"The Vegetables March In"

It is not too late to start planting for victory. In the leaflet, "The Vegetables March In," Miss G. C. Hearn, B.Sc. (H. and S.S.), Diploma in Agriculture, gives helpful advice to the owner of a small garden, allotment or sunny window sill, on how to grow food. The Author tells her readers how to make a compost heap, what crops to grow and where, how to protect the vegetables from the army of pests, how to ensure a good crop, and how to gather and store the harvest.

This leaflet is the fifth of the series "I Pass This On To You," issued by the Women's Gas Council, price 1d., postage 1d., or 1s. for six of the series, obtainable from the Women's Gas Council, Gas Industry House, 1, Grosvenor Place, London, S.W. 1.

Gas Products Prices

The London Market

June 17.

Present values of tar products in London are as follows: Pitch, about 50s. per ton f.o.b.; creosote, about 4¾d. to 5d. per gallon; refined tar, 3¾d. to 4d. per gallon; the price of pure toluole under the Ministry of Supply order is just under 2s. 5d. per gallon; pure benzole, 1s. 10d.; 95/160 solvent naphtha, 1s. 11d. to 2s., and 90/160 pyridine about 18s. 6d., all per gallon naked; refined naphthalene crystals, £23 per ton in bags, all *ex* makers' works.

The Provinces

June 17.

Crude Gas-Works tar, 27s. 3d. to 32s. 3d.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch—East Coast, 47s. 6d. to 52s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 47s. 6d. to 52s. 6d.* Toluole, naked, North, 1s. 9¼d. (Controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 9d. to 9¼d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 4¼d. to 1s. 5¼d. Creosote, *ex* works, in bulk, North, liquid and salty, 4¼d. to 4¾d.; Scotland, 4¼d. to 4¾d.; low gravity, 4¼d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's, 3s. 6d. to 3s. 7½d. Naphthalene, £15 to £20. Salts, 75s. to 85s., bags included. Anthracene, "A" quality, 4¼d. to 4¾d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil, (min. gr. 1,080), 5¼d. to 5¾d.; filtered heavy oil (min. gr. 1,080), 5¾d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6¼d.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls, whatever they may be.

Scotland

GLASGOW, June 15.

Prices of all products continue steady and although new business is not plentiful producers are comfortably placed.

Crude gas-works tar.—The actual value is about 42s. 6d. to 45s. per ton *ex* works in bulk.

Pitch.—Local production is readily saleable as available at 40s. per ton f.o.b. for export and 37s. 6d. per ton *ex* works in bulk for home trade.

Refined tar.—Home contracts for reduced quantities are being placed at 4¼d. to 4½d. per gallon, while for export business is quiet with supplies available at 3½d. per gallon, both f.o.r. naked.

Creosote oil.—Supplies of all grades can be secured at the following prices: Specification oil, 5¼d. to 5¾d. per gallon; low gravity, 6¼d. to 7d. per gallon; neutral oil, 6d. to 6¼d. per gallon; all *ex* works in bulk.

Cresylic acid.—New business is scarce, but quotations are being maintained as under: Pale, 97/99%, 2s. 1d. to 2s. 2d. per gallon; dark, 97/99%, 1s. 10d. to 1s. 11d. per gallon; pale, 99/100%, 2s. 6d. to 2s. 8d. per gallon; all *ex* works in buyers' packages.

Crude naphtha is valued at 6½d. to 7¼d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 8½d. to 1s. 9½d. per gallon and 90/190 heavy naphtha is 1s. 4½d. to 1s. 5½d. per gallon.

Motor benzole is 1s. 8d. to 1s. 8½d. per gallon.

Pyridine.—Values are called 18s. to 19s. per gallon for 90/160 grade and 20s. to 21s. per gallon for 90/140 grade.

Trading Results

Meters, Ltd.

The report of the Directors of Meters, Ltd., for the year ended March 31, 1940, states that the net profit amounts to £19,567, which added to the balance of £13,376 brought forward, gives a total of £32,943. After deducting the interim dividends amounting to £5,324 paid in November last, the amount now available for appropriation is £27,619. The Directors recommend the following: (a) The creation of a reserve for taxation of £1,200; (b) the creation of a reserve for further air raid precaution expenses of £2,200; (c) the payment of final dividends for the year ended March 31, 1940, of 2¾% (actual) upon the preference stock, and of 6½% (actual) upon the ordinary stock, making the total dividends for the year 5½% upon the preference stock and 9% upon the ordinary stock (both less income-tax); (d) that the balance of £13,841 be carried forward to next year's accounts.

Stream-Line Filters, Ltd.

At the fourth annual general meeting of Stream-Line Filters, Ltd., Mr. C. S. Garland (Chairman and Managing Director), after stating that in view of the present conditions the proposed issue of further capital and the extensions to the factory had been deferred until conditions were more settled, proceeded to deal with the effect of the war on the Company's operations. He said that as regarded their ordinary business, having world-wide master patents, the Company had always had an extensive overseas trade. The war had seriously restricted their operations in Europe, but in spite of those handicaps their trade had increased in every month of 1939 over the corresponding month of the previous year, and that increase still continued in 1940. The regretted reduction of the dividend from 20% to 10% was due solely to the high proportion of profit required for taxation. In spite of the closing of many garages and the virtual extinction of private pleasure motoring, there remained a wide field for their products at home and abroad, and the Directors, in view of the continued expansion of sales, saw no reason to doubt that profits would be maintained.

W. G. Allen & Sons (Tipton).—7½%, making 10%.

Allied Ironfounders.—Profit, £112,424 (£198,428); 2½%, making 5% (9%).

British Vacuum Cleaner.—Preference dividend deferred until end of year.

Electric Construction.—Profit, £57,363 (£88,962); 10% (same); no bonus (3½%); income-tax and N.D.C., £15,000 (same); dividend equalization and other reserves, nil (£30,000); fwd., £25,459 (£20,096).

Keith Blackman.—Profit, £32,770 (£32,528) after £19,500 (£10,700) for income-tax and N.D.C., and writing off cost of A.R.P. £17,637; div. 15% (same).

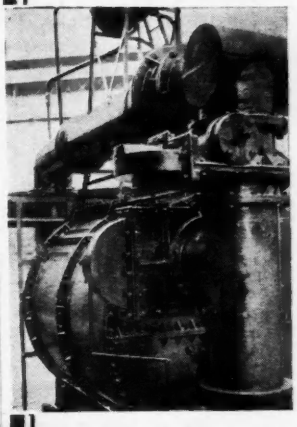
Minimax.—Profit £60,746 (£44,060); 8% and bonus 4%, making 20% (same, but on capital increased by 25% scrip bonus); written off patents, &c., £486 (£344); off A.R.P. expenditure, £1,500; to tax reserve £30,000 (£5,000); staff fund reserve £2,000 (£3,000); share bonus issue expenses, £384; forward £30,782 (£29,405).

Modern Machine Tools.—Profit, £23,250 (£15,872); 7½%, making 15% (same); investment reserve, £2,000 (nil); forward, £43,957 (£34,857).

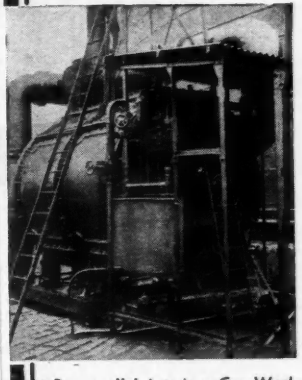
Peter Brotherhood.—Profit, £145,269 (£99,589); 12%, making 20% (24%); income-tax and E.P.T., £63,500 (£16,250); war risks insurance, £4,819 (nil); A.R.P., £7,500; special depreciation, £10,000 (same); fwd. £118,242 (£104,266).

Warrants in Payment of the half-yearly Wharncliffe Silkstone Colliery Co., Ltd., preference dividend to June 30, 1940, at the rate of 6% per annum and a 5% (actual) interim dividend on the ordinary shares will be posted on June 30, 1940.

When a Joint leaks—



"Permac" Joints in a Gas Works



"Permac" Joints in a Gas Works.

Consider the loss in output while the plant is shut down and the joint is being re-made.

"Permac" the original Metal-to-Metal Jointing makes leak-proof joints that last till you want to break them down. Stands up to all temperatures and pressures. Equally successful on steam, gas, water, oil joints.

Send for particulars

Permac
METAL-TO-METAL JOINTING MATERIAL.

Sole manufacturers:

THOMAS & BISHOP LTD
37, Tabernacle St., LONDON, E.C.2

Telephone: Clerkenwell 3351 (2 lines)

For every size of works and every class of coal...

WEST'S

CARBONIZING PLANTS

GLOVER-WEST VERTICALS

WESTVERTICAL CHAMBERS

440 carbonizing plants have been built or are under construction by West's in 24 countries. Working results from a wide variety of gas coals have established the high efficiency and adaptability of the West systems.

WEST'S

GAS IMPROVEMENT CO · LTD ·

MILES PLATTING MANCHESTER 10

TELEPHONE—COLLYHURST 2961-2-3-4-5 · TELEGRAMS—STOKER, MANCHESTER

LONDON OFFICE TEMPORARY ADDRESS—BATH ROAD · HARMONDSWORTH · WEST DRAYTON · MIDDLESEX TEL.—WEST DRAYTON 2288-9

GAS STOCKS AND SHARES

The Stock Exchange has passed through another week of grave events. Italy's entry into the war had little, if any, effect on prices, but the fall of Paris naturally led to an all round marking down although there was no stampede selling. Business is almost confined to forced sales and these were mostly absorbed in gilt-edged stocks. After the initial fall British Funds began to pick up, but with the cessation of buying orders prices closed fractionally lower—2½% Consols being 72 against 72½ a week ago. Home rails followed the trend of the "Funds." There was occasionally some activity in the industrial market, though prices have no stability and show exaggerated movements for almost each transaction. The more speculative markets were particularly quiet.

Similar conditions prevailed in the Gas Market and a number of quotations were marked down, some severely. Among "ordinaries" for instance, South Metropolitan closed 9½ points lower than a week ago at 45; Portsmouth consolidated and South Suburban both dropped 5, while Imperial Continental and Tottenham lost 3 points each. A large number of fixed-interest stocks also weakened and these included a fall of 7 points in Gas Light 3% debenture to 65½. No serious relapses occurred on the Provincial Exchanges, but in the Supplementary List Eastbourne "A" and "B" stocks and Cambridge 7% all showed substantial falls.

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 14.	Rise or Fall on Week.
1,767,439	Mch. 11	8	7	Alliance & Dublin Ord. ...	110—115	...
374,000	Dec. 27	4	4	Do. 4 p.c. Deb ...	80—90	...
957,608	May 13	5	5	Asscd. Gas & Water U'd'ts Ord.	14/—16/-	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	15/6—17/6	..
535,545	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	14/6—16/6	...
336,646	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	13/—15/-	...
750,000	Mch. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	82—87	...
560,070	Feb. 19	7	7	Barnet Ord. 7 p.c.	122—127	..
300,000	Apl. 8	1/4⅜	1/9⅜	Bombay, Ltd.	19/6—21/6	...
181,915	Feb. 26	9½	9½	Bournemouth Sliding Scale ...	145—150	...
690,526	,,	7	7	Do. 7 p.c. max. ...	118—123	..
493,960	,,	6	6	Do. 6 p.c. Pref. ...	116—121	...
50,000	Dec. 18	3	3	Do. 3 p.c. Deb. ...	70—75	...
362,025	,,	4	4	Do. 4 p.c. Deb. ...	95—100	...
335,000	,,	5	5	Do. 5 p.c. Deb. ...	102—107	...
357,900	Feb. 19	7½	6¾	Brighton, &c., 6 p.c. Con. ...	103—108	..
659,955	,,	6¾	5¾	Do. 5 p.c. Con. ...	98—103	−2
205,500	,,	6	6	Do. 6 p.c. 'B' Pref. ...	103—108	...
855,000	Mch. 11	7	8	British Ord.	90—100	...
100,000	Dec. 18	7	7	Do. 7 p.c. Pref.	120—125	...
350,000	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	,,	4	4	Do. 4 p.c. Red. Deb.	77—82	...
450,000	,,	5	5	Do. 5 p.c. Red. Deb.	100—105	...
100,000	22 May '33	6	4	Cape Town, Ltd.	½—¾	...
100,000	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref.	½—¾	...
150,000	Dec. 18	4½	4½	Do. 4½ p.c. Deb.	53—58	...
626,860	Jan. 29	6	5⅞	Cardiff Con. Ord.	103—108	...
237,860	Dec. 18	5	5	Do. 5 p.c. Red. Deb. ...	95—100	...
98,936	Apl. 8	2/-	2/-	Colombo Ord.	1½—1¾	...
24,510	,,	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	19/6—21/6	−/6
739,453	Mch. 26	-/11.48	-/11.48	Colonial Gas Assn. Ltd. Ord. ...	14/6—16/6	...
296,144	,,	1/3.30	1/3.30	Do. 8 p.c. Pref.	20/—22/-	...
1,775,005	Jan. 29	4	2	Commercial Ord.	45—50	...
140,000	Feb. 19	4	4	Do. 4 p.c. Red. Pref. ...	87—92	...
620,000	June 10	3	3	Do. 3 p.c. Deb.	61—66*	−1
286,344	Feb. 19	5	5	Do. 5 p.c. Deb.	97—102	...
200,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	93—98	...
807,560	Feb. 12	7	7	Croydon sliding scale	95—100	...
644,590	,,	5	5	Do. max. div.	85—90	...
620,385	Dec. 7	5	5	Do. 5 p.c. Deb.	100—105	...
208,660	Feb. 19	5	5	Dudley, Brierley Hill & Dist. Ord.	98—103	...
82,275	,,	5	5	Do. 5 p.c. Con. Pref. ...	93—98	...
79,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	93—98	...
239,000	Jan. 29	5	88/6	East Hull Ord. 5 p.c.	70—80	...
187,215	Feb. 12	5⅜	5⅜	East Surrey Ord. 5 p.c. ...	93—98	...
176,211	Dec. 18	5	5	Do. 5 p.c. Deb. ...	100—105	...
250,000	Nov. 13	8	4	Gas Consolidation Ord. 'B' ...	15/—17/-	...
250,000	May 13	4	4	Do. 4 p.c. Red. Cum. Pref.	15/—17/-	...
19,152,410	Jan. 29	5⅜	3⅜	Gas Light & Coke Ord. ...	11/9—12/9d	...
2,600,000	,,	3½	3½	Do. 3½ p.c. max.	55—60	−3
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	82—87	..
2,993,000	Jan. 2	3¾	3¾	Do. 3¾ p.c. Red. Pref. ...	85—90	−1
8,602,497	June 3	3	3	Do. 3 p.c. Con. Deb. ...	63—68	−7
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	100—105	...
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	97—102	−1
700,000	Mch. 11	3½	3½	Do. 3½ p.c. Red. Ded. ...	87—92	...
270,466	Feb. 19	6	6	Harrogate New Cons.	93—98	...
157,500	Apl. 8	‡1/-	‡1/-	Hong Kong and China Ord. ...	½—¾	...
5,600,000	May 13	4	8	Imperial Continental Gas. ...	45—50	−3
172,810	Jan. 29	3½	3½	Do. 3½ p.c. Red. Deb. ...	70—75	...
63,480	Dec. 18	3	3	Maidstone 3 p.c. Deb.	55—60	...
45,000	June 10	†8	†10	Malta & Mediterranean ...	92—102	...
				Metropolitan (of Melbourne) ...		
392,000	Apl. 1	5½	5½	5½ p.c. Red. Deb.	88—98*	−4
231,977	Feb. 19	5	5	M.S. Utility 'C' Cons.	77—82	...
968,658	,,	4	4	Do. 4 p.c. Cons. Pref. ...	83—88	...
390,076	Dec. 18	4	4	Do. 4 p.c. Deb. ...	87—92	...
1,487,955	Dec. 18	5	5	M.S. Utility 5 p.c. Deb. ...	103—108	...
374,000	,,	3½	3½	Do. 3½ p.c. Red. Bds. ...	90—95	...
1,000,000	Mch. 18	7½	5⅞	Montevideo, Ltd.	58—63	...
250,000	,,	5	5	North Middlesex 6 p.c. Con. ...	103—108	...
396,160	Jan. 29	5	5	Northampton 5 p.c. max. ...	97—102	...
300,000	Apl. 29	9	7	Oriental, Ltd.	113—118	...
468,537	June 3	7	8	Plymouth & Stonehouse 5 p.c.	113—118	−2
621,667	Feb. 5	8½	8½	Portsmouth & Gosport Cons.	105—110	−5
41,446	,,	5	5	Do. 5 p.c. max.	82—87	−3
73,350	,,	5	5	Do. 5 p.c. Pref.	88—93	...
75,000	,,	4	4	Do. 4 p.c. Pref.	75—80	...
114,000	Feb. 5	5	5	Preston 5 p.c. Pref.	88—93	...
247,966	Dec. 18	4	4	Primitiva 4 p.c. Cons. Deb. ...	93—98	..
625,959	Jan. 15	4	4	Do. 4 p.c. Red. Deb. ...	91—96	...
15,000	Mch. 11	6	6	San Paulo 6 p.c. Cum. Pref. ...	7½—8½	...
441,275	Apl. 29	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	16/6—18/6	...
460,810	Mch. 11	-/10⅝	-/10⅝	,, ,, 4½ p.c. Cum. Pref. ...	16/6—18/6	...
133,201	Feb. 12	8½	5	Shrewsbury 5 p.c. Ord. ...	105—115	...
9,000	June 5	‡4	‡4	South African Ord.	4—5	...
1,996,297	Apl. 29	1/2⅜	1/	South East'n Gas Cn. Ld. Ord.	12/6—14/6	...
1,000,000	Mch. 4	-/10½	-/10⅝	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
769,191	,,	4	4	Do. 4 p.c. Cum. Pref. ...	13/—15/-	..
450,000	Feb. 12	4	4	Do. 4 p.c. Red. Deb. ...	95-100	...
150,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94	...
6,709,895	,,	5	4	South Met. Ord.	40—50	−9½
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	109—114	...
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	82—87	..
1,895,445	Dec. 27	3	3	Do. 3 p.c. Deb.	68—73	−2
1,000,000	Jan. 15	5	5	Do. 5 p.c. Red. Deb. ...	98—103	..
600,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97	...
1,543,795	Feb. 5	6	3	South Suburban Ord. 5 p.c. ...	70—75	−5
512,925	,,	5	5	Do. 5 p.c. Pref.	90—95	−3
500,000	,,	4	4	Do. 4 p.c. Pref.	82—87	..
250,000	,,	3¾	3¾	Do. 3¾ p.c. Red. Pref. ...	85—90	..
888,587	June 10	5	5	Do. 5 p.c. Deb.	98—103*	−2
250,000	,,	4	4	Do. 4 p.c. Deb.	85—90*	−2
200,000	Feb. 12	3½	3½	Do. 3½ p.c. Red. Deb. ...	87—92	...
427,859	Apl. 15	-/9⅜	1/2⅜	S. Western Gas & Water Ord.	13/—15/-	...
160,523	,,	-/10½	-/10⅝	Do. 4½ p.c. Red. Cum. Pref.	15/—17/-	...
110,000	Dec. 48	4	4	Do. 4 p.c. Red. Deb. ...	90—95	...
750,541	Feb. 5	5	5½	Southampton Ord. 5 p.c. ...	77—82	...
148,836	Dec. 27	4	4	Do. 4 p.c. Deb.	87—92	...
350,000	Feb. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	97—102	...
200,000	Dec. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—100	...
1,076,490	Feb. 26	6½	5	Tottenham and District Ord....	87—92	−3
409,835	,,	5½	5½	Do. 5½ p.c. Pref.	102—107	...
62,235	,,	5	5	Do. 5 p.c. Pref.	93—98	−2
453,380	June 10	4	4	Do. 4 p.c. Deb.	85—90*	−2
1,247,505	May 20	4	6	U. Kingdom Gas Cor. Ord. ..	13-/—15/-	...
1,085,952	May 13	4½	4½	Do. 4½ p.c. 1st Cum. Pref. ...	14/6—16/6	...
772,709	,,	4	4	Do. 4 p.c. 1st Red. Cum. Pf.	14/—16/-	...
745,263	Dec. 18	4½	4½	Do. 4½ p.c. 2nd Non-Cum. Pf.	13/—15/-	...
1,093,656	Mch. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	83—88	...
378,106	Mch. 11	7	7	Uxbridge, &c., 5 p.c.	95—100	...
133,010	,,	5	5	Do. 5 p.c. Pref. ,,	95—100	...
1,371,138	Feb. 5	6½	3½	Wandsworth Consolidated ...	68—73	...
2,525,768	,,	4	4	Do. 4 p.c. Pref.	78—83	−2
1,343,964	Dec. 18	5	5	Do. 5 p.c. Deb.	98—103	−2
383,745	,,	4	4	Do. 4 p.c. Deb.	87—92	...
400,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
558,342	Jan. 29	6¾	6	Watford and St. Albans Ord. ...	95—100	...
200,000	,,	5	5	Do. 5 p.c. Pref.	93—98	−2
200,000	,,	5½	5½	Do. 5½ p.c. Pref.	100—105	...
200,000	,,	4	4	Do. 4 p.c. Rd. Pf. (1973/8)	85—90	..
100,000	,,	33/4§	4	Do. 4 p.c. Red. Pf. (1959)	93—98	..
200,000	June 10	3½	3½	Do. 3½ p.c. Red. Deb. ...	85—90*	−2

d.—The quotation is per £1 of Stock. * Ex. Div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Contd.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations June 14.	Rise or Fall on Week
202,152	Mch. 18	5	5	Ascot Ord.	80—85	...
128,182	Dec. 27	5	5	Do. 5 p.c. Pref. ...	88—93	...
31,035	Mch. 4	-/9⅜	-/9⅜	Associated Utilities 4 p.c. Pref.	15/—17/-	...
100,000	Dec. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
17,000	Feb. 19	8	8	Bognor Orig. Ord. 'A' ...	102—112	...
62,210	,,	8	8	Do. New Add. 'A' ...	102—112	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	95—105	...
37,440	Jan. 29	10	10	Cam. Univ. & Town 10 p.c. max.	145—155	...
125,970	,,	7	7	Do. 7 p.c. max.	100—110	-10
39,025	,,	5	5	Do. 5 p.c. max.	80—90	...
96,410	Jan. 29	4½	4½	Cardiff 4½ p.c. Pref.	90—95	...
55,520	Feb. 19	6	6	Colchester 6 p.c. Pref.... ...	100—105	...
90,550	Mch. 18	5	5	Do. 5 p.c. Deb. ...	98—103	...
150,000	Feb. 12	4	4	Croydon 4 p.c. Pref.	82—87	...
130,000	Dec. 27	4	4	Do. 4 p.c. Deb.	87—92	...
65,000	Mch. 4	7½	6⅞	Eastbourne 'A' 5 p.c.	100—105	-5
198,000	,,	6	5⅝	Do. 'B' 3½ p.c.	83—88	-10
112,312	,,	5	5	Do. 5 p.c. Pref.	90—95	...
130,000	Dec. 18	5	5	Do. 5 p.c. Deb.	98—103	...
130,500	Feb. 19	7½	7½	Exeter New Ord. (£10)	12—14	...
24,000	Aug. 21	8½	8½	Gt. Yarmouth 8½ p.c. max. (£30)	15—20	...
59,400	,,	7½	7½	Do. 7½ p.c. max. (£30) ...	10—15	...
51,160	June 10	5½	5½	Do. 5½ p.c. Deb.	100—105*	...
152,600	Feb. 26	8	9	Guildford Cons. ...	110—120	...
54,055	,,	5	5	Do. 5 p.c. Pref.	90—95	...
68,250	Dec. 11	5	5	Do. 5 p.c. Deb.	103—108	...
156,600	Feb. 19	7	5	Hampton Court Cons. ...	75—85	...
86,046	June 19	‡4½	‡5	Holyh'd&N.W.G.&W.Cpn.Ord.	13/6—15/6	...
80,000	Feb. 12	4	4	Lea Bridge 4 p.c. Pref.	75—80	...
60,000	,,	6	6	Do. 6 p.c. Pref.	105—115	...
94,876	Dec. 18	4	4	Do. 4 p.c. Deb.	88—93	...
73,620	Mch. 18	8½	8½	Luton Cons. 'A'	115—125	...
107,960	Feb. 26	4	5½	Mid Kent Ord. (£10)	7½—8½	...
230,940	Feb. 5	10	10	Oxford & District Ord. ...	135—145	...
47,112	,,	5	5	Do. 5 p.c. Pref.	85—90	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
126,193	May 13	7½	7½	Peterborough Ord.	138—148	...
64,990	Mch. 18	7	7	Redditch Ord.	100—110	...
166,850	Feb. 19	8	8	Romford Ord.	108—118	...
60,000	,,	4	4	Do. 4 p.c. Pref.	85—90	...
44,000	Mch. 18	5	5	Do. 5 p.c. Deb.	97—102	...
25,570	Feb. 12	5½	5½	Rugby 5½ p.c. Pref.	100—110	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
42,750	De.. 11	5½	5½	Do. 5½ p.c. Deb.	105—110	...
110,950	Feb. 26	8	8	Ryde Ord.	100—110	...
270,086	Mch. 18	7	7	Slough Ord.	98—103	...
21,000	June 10	5	5	Do. 5 p.c. Deb.	97—102*	-1
28,872	May 13	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	14/—16/-	...
28,866	Mch. 18	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
127,228	Feb. 19	5	7	Swindon Cons.	75—80	...
60,425	Dec. 18	5	5	Do. 5 p.c. Deb.	95—100	...
64,380	,,	5	5	Torquay & Paignton 5 p.c. Pref.	85—90	...
130,000	Feb. 12	5	5	Wakefield Ord.	85—95	...
81,650	,,	5	5	Do. 5 p.c. max.	75—80	...
82,000	Jan. 29	6	6	Weymouth Ord.	82—87	...
273,626	Feb. 12	7	7	Wolverhampton Cons. Ord. ...	115—120	...
98,384	,,	6	6	Do. 6 p.c. Pref.	105—115	...
160,000	Dec. 18	5½	5½	Do. 5½ p.c. Red. Deb. ...	100—105	...
106,490	Mch. 18	5½	5½	Wrexham Ord	75—85	...
90,000	Dec. 18	5	5	York 5 p.c. Red. Deb.	95—100	...
133,640	Feb. 19	6	6	Yorktown (Cam.) 5 p.c. Cons.	82—87	...
120,000	,,	5	5	Do. 5 p.c. Pref.	85—90	...
35,000	Dec. 18	5½	5½	Do. 5½ p.c. Deb.	105—110	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 14.	Rise or Fall on Week.
347,756	Feb. 1	5	6	Bath Cons.	105—107	...
1,667,250	Feb.	5	5	Bristol, 5 p.c. max.	97—100	-1½
120,420	Dec.	4	4	Do. 1st 4 p.c. Deb.	96—99	-2
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	96—99	-2
328,790	,,	5	5	Do. 5 p.c. Deb.	115—117	...
274,000	Feb. 26	5	5	Newport (Mon.) Ord.... ...	91—94	...
13,200	Mch. 26	7	8½	Pontyp'l Gas & W. 10 p.c. 'A'	11½—12½	...
13,600	,,	5	6	Do. 7 p.c. 'B'	10—11	...
40,000	,,	5	6	Do. 7 p.c. 'C'	10—11	...
140,778	Feb. 12	5	5	Weston-super-Mare Cons. ...	92—96	...
64,338	Dec. 27	4	4	Do. 4 p.c. Deb.	90—95	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	140—150	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 14.	Rise or Fall on Week.
157,150	Feb. 5	5	6½	Chester 5 p.c. Ord.	98—101	...
92,500	Dec. 18	4	4	Do. 4 p.c. Pref.	84—88	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	85—88	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—99	...
2,167,410	Feb. 19	6	6	Liverpool 5 p.c. Ord.	106—108	-1
245,500	Dec. 18	5	5	Do. 5 p.c. Red Pref. ...	99½—102½	...
306,083	July 17	4	4	Do. 4 p.c. Deb.	99—101	...
106,280	Feb. 5	10	8	Preston 'A' 10 p.c.	160—170	...
188,219	,,	7	7	Do. 'B' 7 p.c.	115—125	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 14.	Rise or Fall on Week.
122,577	Feb. 19	7	7	Blyth 5 p.c. Ord.	113—118	...
732,000	Feb. 19	4	4	Hartlepool G. & W. Cn. & New	65—67	...
2,430,267	Feb. 5	5	5 7/10	Newcastle & Gateshead Con.	17/—18/a	-/6
682,856	,,	4	4	Do. 4 p.c. Pref.	85—86	...
776,706	Dec. 27	3½	3½	Do. 3½ p.c. Deb.	82—87	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	97—102	...
332,351	Feb. 5	6	6	Sunderland 6 p.c. max. ...	111—113	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 14.	Rise or Fall on Week.
542,270	Feb. 12	6	9	Derby Con.	103—108	...
55,000	June 10	4	4	Do. 4 p.c. Deb.	96—102*	-2
20,000	Dec. 18	5	5	Long Eaton 5 p.c. Pref. ...	9—11	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	100—106	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 14.	Rise or Fall on Week.
10,000	Feb. 19	10	10	Great Grimsby 'A' Ord. ...	170—180	...
6,500	,,	10	10	Do. 'B' Ord. ...	170—180	...
79,000	,,	10	10	Do. 'C' Ord. ...	160—170	...
1,806,339	Feb. 26	6½	6½	Sheffield Cons.	123—126	-½
95,000	Jan. 2	4	4	Do. 4 p.c. Deb.	98—100	...

a The quotation is per £1 of Stock.
* Ex. div. ‡ For year.

Easy-Clean Water Heaters

A patent just granted to J. H. Ewart and Ewart & Son, Ltd. (No. 520,866; application date, Nov. 2, 1938), has as its object an easy-to-clean instantaneous gas water heater of a type economical to manufacture.

According to the invention, the body of the appliance is seated on an annular member forming a part of a wall bracket by which the heater, when installed, is supported from the wall. The base of the heater is a separate entity from the body, depends from the annular member, and forms with the burner a unit which is removable after disconnexion of the base from the annular member and the burner from a standing portion of the gas supply.

In this way, claim the patentees, cleaning is exceedingly simple. All that is required is to disconnect the gas burner from the standing gas supply, disconnect the base from the annular member of the wall bracket, and if the arrangement is one in which the usual water control fitting is supported from the base by some form of detachable connexion, disconnect this fitting from the base. Then the entire unit comprising the gas burner and the base is removable as such from the wall bracket and the rest of the heater.

In one embodiment of the invention the wall bracket comprises a vertical flange screwed or bolted to the wall. This carries an annular member in the form of a circularly bent strap of strip metal connected at its ends to forwardly bent lugs on the palm portion at the top thereof.

The base of the heater is a metal cylinder which surrounds the gas burner of the heater as usual and depends from the annular member of the wall bracket. It is detachably supported on the annular member by means of (say) three screws extending through the strap forming the annular member and projecting at the inner end into an annular groove in the upper marginal portion of the base slightly inset from the edge thereof.

The lower end of the base is beaded. The bead at the lower edge and the groove near the upper edge of the base serve to stiffen the base against deformation. The heater body is seated on the annular member of the wall bracket.

The gas burner is of usual form, being a double concentric ring burner with a gas branch leading radially from the rings at one side. It is connected to a tap fitting in turn connected to a standing gas supply pipe leading from the service to the heater. The radial gas branch of the burner extends, therefore, through a hole provided to receive it in the base of the heater and where it so extends through this hole it is firmly secured to the base by a nut on an exteriorly screw-threaded portion of the branch.

The burner is also secured to the base at two other points by screws which extend through the base and screw at their inner end into bosses provided to receive them on the outer ring of the burner casting.

The water supply pipe for the heater leads to a tap forming a part of the heater and is screw-connected to the base by a pair of screws extending through holes in a lug portion of the tap fitting.

When it is required to remove the burner-base unit, the only operations necessary to free this fitting are to unscrew the two screws just referred to, connecting the water tap fitting to the base; disconnect the gas tap fitting from the supply pipe leading to it from the house main; and unscrew the three screws first mentioned.